

**Statement of the Communications Authority and
the Secretary for Commerce and Economic Development**

**Arrangements for the Frequency Spectrum in
the 900 MHz and 1800 MHz Bands upon
Expiry of the Existing Assignments for
Public Mobile Telecommunications Services and
the Spectrum Utilisation Fee**

19 December 2017

PURPOSE

This Statement promulgates the decision of the Communications Authority (“CA”) to adopt a hybrid administratively-assigned cum market-based approach to re-assign 200 MHz of spectrum in the 900 MHz and 1800 MHz bands upon the expiry of the existing assignments, on dates between 19 November 2020 and 11 January 2021 and on 29 September 2021 respectively. This Statement also announces the decision of the Secretary for Commerce and Economic Development (“SCED”) on the method for determining the related spectrum utilisation fee (“SUF”), which he will propose to prescribe by subsidiary legislation.

EXECUTIVE SUMMARY

S1. A hybrid administratively-assigned cum market-based approach will be adopted for the re-assignment/assignment of 50 MHz of spectrum in the 900 MHz band and 150 MHz of spectrum in the 1800 MHz band upon the expiry of their existing assignments for the provision of public mobile telecommunications services.

S2. Each of the four incumbent spectrum assignees, viz. China Mobile Hong Kong Company Limited (“CMHK”), Hong Kong Telecommunications (HKT) Limited (“HKT”), Hutchison Telephone Company Limited (“Hutchison”), and SmarTone Mobile Communications Limited (“SmarTone”), will be offered a right of first refusal to be re-assigned 2 x 10 MHz of spectrum

in the 1800 MHz band, viz. in total, 2 x 40 MHz of spectrum (“RFR Spectrum”), in frequency ranges as specified in Table 1 under paragraph 77 of this Statement.

S3. The remaining 70 MHz of spectrum in the 1800 MHz band and all the 50 MHz of spectrum in the 900 MHz band (as specified in Table 2 under paragraph 78 and Table 3 under paragraph 81 of this Statement respectively) will be assigned by way of auction. If any incumbent spectrum assignee decides not to exercise the right of first refusal to take up the RFR Spectrum, the spectrum thus becoming available in the 1800 MHz band will be pooled together with the above frequency slots for assignment by way of auction (“Auctioned Spectrum”). A single spectrum auction will be conducted, in around the end of 2018, for the assignment of the Auctioned Spectrum. A spectrum cap of 90 MHz will be imposed on the aggregate amount of spectrum in the 900 MHz and 1800 MHz bands which may be acquired by any assignee, with a sub-cap of 20 MHz for spectrum in the 900 MHz band that may be acquired by any successful bidder, through competitive bidding in the auction.

S4. The new spectrum assignment period for all the spectrum in the 900 MHz band will be aligned to commence on 12 January 2021 for a 15-year period until 11 January 2036. For the spectrum in the 1800 MHz band, the new spectrum assignment period will commence on 30 September 2021 for a 15-year period until 29 September 2036.

S5. As regards the methods for determining the related SUF, SCED decided that it is appropriate to set the auction reserve price for the Auctioned Spectrum in both the 900 MHz and 1800 MHz bands at \$38 million per MHz. As for the RFR Spectrum which falls in the 1800 MHz band, SCED decided that it is appropriate to set the SUF per MHz at the average SUF per MHz of the Auctioned Spectrum in the 1800 MHz band as determined by auction, subject to a minimum price of \$54 million and a cap of \$70 million.

S6. On the method of payment, spectrum assignees will be given a choice to pay the SUF either by lump sum payment upfront or by annual instalments, with the first instalment equivalent to the lump sum payment divided by 15 and with subsequent instalments increased every year by 2.5% to reflect the time value of money. If a spectrum assignee chooses to pay the SUF by annual instalments, the Government will require a five-year rolling guarantee of the SUF payment throughout the whole assignment period.

S7. SCED will propose subsidiary legislation under the Telecommunications Ordinance (Cap. 106) (“TO”) to prescribe the methods for determining the SUF of the Auctioned Spectrum and that of the RFR Spectrum, and the choices of methods of SUF payment. The subsidiary legislation will be tabled at the Legislative Council for negative vetting.

S8. To ensure compliance with the network and service rollout obligations under the licence, successful bidders who have newly acquired spectrum in the 900 MHz and 1800 MHz bands, and incumbent spectrum assignees who are assigned frequency slots in the Auctioned Spectrum where the majority of the spectrum in any of these slots is not currently held by them will be required to lodge a performance bond.

INTRODUCTION

Frequency spectrum in the 900 MHz and 1800 MHz bands, totalling 198.6 MHz, has been assigned to mobile network operators (“MNOs”)¹ for the provision of public mobile telecommunications services. This represents 36% of the total of 552 MHz of spectrum assigned for such purpose. The relevant spectrum comprises 49.8 MHz in the 900 MHz band and 148.8 MHz in the 1800 MHz band, and is being deployed for the provision of the second, third and fourth generation (“2G”, “3G” and “4G”) mobile services². The existing assignments of the 49.8 MHz of spectrum in the 900 MHz band are due to expire on dates between 19 November 2020 and 11 January 2021; while those of the 148.8 MHz of spectrum in the 1800 MHz band are due to expire on 29 September 2021.

2. Taking into account the 0.2 MHz of spectrum in the 900 MHz band

¹ All the four MNOs, namely, CMHK, HKT, Hutchison, and SmarTone are assigned spectrum in the 1800 MHz band. Three of them (HKT, Hutchison and SmarTone) also hold spectrum in the 900 MHz band. Details of their respective overall frequency holdings and their holdings in the 900 MHz and 1800 MHz bands are shown in [Table 1](#) at **Annex 1** of this Statement.

² From mid-2017 onwards, some of the spectrum in the 900 MHz band originally used for the provision of 3G services is being refarmed for the provision of 4G services. But before the completion of the refarming process, the spectrum concerned is still being used for the provision of 3G services in certain locations.

and 1.2 MHz of spectrum in the 1800 MHz band which is currently vacant³, a total of 200 MHz of spectrum, comprising 2 x 25 MHz in the frequency ranges of 890 – 915 MHz paired with 935 – 960 MHz and 2 x 75 MHz in the frequency ranges of 1710 – 1785 MHz paired with 1805 – 1880 MHz (“900/1800 MHz Spectrum”), will be available for assignment/re-assignment (hereafter collectively referred to as “Re-assignment of the 900/1800 MHz Spectrum”).

3. Two rounds of public consultation have been conducted jointly by the CA and SCED to solicit views and comments of the telecommunications industry and other affected persons on the arrangements for the Re-assignment of the 900/1800 MHz Spectrum upon expiry of the existing assignments and the related SUF.

4. In the first consultation paper issued in February 2016 (“First Consultation Paper”)⁴, the CA proposed for consultation three re-assignment options for the 900/1800 MHz Spectrum, viz. a full-fledged administratively-assigned approach, a full-fledged market-based approach and a hybrid approach. The CA made it clear in the First Consultation Paper that it would choose the option that could be expected to best meet the four objectives for spectrum re-assignment which it had identified, viz. ensuring customer service continuity, efficient spectrum utilisation, promotion of effective competition, and encouragement of investment and promotion of innovative services. SCED also set out in the First Consultation Paper the proposed methods of setting the SUF under each of the three proposed spectrum re-assignment options.

5. Having considered carefully views and comments received in response to the First Consultation Paper and the findings of the independent consultancy study (“Study”) conducted by an external consultant (“Consultant”) appointed by the CA through the Office of the Communications Authority (“OFCA”) on the impact on service quality arising from the various spectrum re-assignment options proposed in the First Consultation Paper, the CA put forward a revised version of the hybrid administratively-assigned cum market-based option for further consultation in the second consultation paper

³ The currently vacant spectrum of 0.2 MHz in the 900 MHz band is already designated under the Telecommunications (Designation of Frequency Band subject to Payment of Spectrum Utilization Fee) Order (Cap. 106Y) as spectrum the use of which is subject to the payment of SUF, while the currently vacant spectrum of 1.2 MHz in the 1800 MHz band has yet to be so designated.

⁴ The First Consultation Paper is available at:
http://www.coms-auth.hk/filemanager/en/content_711/cp20160203_e.pdf.

issued in February 2017 (“Second Consultation Paper”)⁵. SCED, having taken into account carefully the submissions received in response to the First Consultation Paper, also put forward in the Second Consultation Paper his detailed proposals on the methods of setting the SUF of the portion of the 900/1800 MHz Spectrum to be re-assigned administratively, and that for the rest of the 900/1800 MHz Spectrum to be re-assigned by way of auction under the proposed hybrid option.

6. Having carefully examined the views and comments received in the two rounds of public consultation, including the additional clarifications of the submissions to the Second Consultation Paper provided by some respondents, and the findings of the Study, the CA and SCED set out in this Statement their respective decisions on the arrangements for the Re-assignment of the 900/1800 MHz Spectrum upon expiry of the existing assignments in 2020/21 and the related SUF.

LEGISLATIVE AND POLICY FRAMEWORK

7. Under section 32G(1) of the TO, the CA has the statutory duty to promote the efficient allocation and use of the radio spectrum as a public resource of Hong Kong. Sections 32H(2) and 32I(1) of the TO empower the CA to assign radio frequencies and to designate which of them shall be subject to the payment of SUF following consultation with the telecommunications industry and other persons directly affected by the exercise of such powers.

8. Section 4(4) of the Communications Authority Ordinance (Cap. 616) stipulates that the CA, in performing its functions, must have regard to such of the following matters as appear to it to be relevant in the circumstances: (a) the fostering of an environment that supports a vibrant communications sector to enhance Hong Kong’s position as a communications hub in the region; (b) the encouragement of innovation and investment in the communications market; (c) the promotion of competition and adoption of best practices in the communications market for the benefit of the industry and consumers; and (d) acting in a manner consistent with the provisions of the Hong Kong Bill of Rights Ordinance (Cap. 383).

⁵ The Second Consultation Paper is available at:
http://www.coms-auth.hk/filemanager/en/content_711/cp20170213_e.pdf.

9. Sections 32I(2) and 32I(4) of the TO empower SCED to prescribe the method for determining the SUF and to specify the minimum fee of the SUF (including the minimum fee or reserve price of an auction where it is used for determining the SUF).

10. The Radio Spectrum Policy Framework (“Spectrum Policy Framework”) promulgated by the Government in April 2007 identifies the policy objectives and the guiding principles in spectrum management which the CA should take into account in discharging its spectrum management responsibilities under the TO⁶. The former Telecommunications Authority (“TA”) explained in his statement issued in April 2007 that, in exercising his statutory powers under the TO, he would, in addition to all relevant considerations as required by law, give due regard to the Spectrum Policy Framework to the extent that there would be no inconsistency with the objectives and provisions of the TO⁷.

11. The Spectrum Policy Framework states that the policy inclination is that a market-based approach in spectrum management will be used wherever the CA considers that there are likely to be competing demands from providers of non-Government services, unless there are overriding public policy reasons to do otherwise. The Spectrum Policy Framework makes it clear that there is no legitimate expectation that there will be any right of renewal or right of first refusal upon the expiry of a spectrum assignment under the TO. The Spectrum Policy Framework also explains that a decision on whether to grant a new spectrum assignment, with the same or varied radio frequencies, would be made and notified to the spectrum assignee within a reasonable time before the expiry of its spectrum assignment. The former TA further specified in his Statement on Minimum Notice Periods for Variation or Withdrawal of Spectrum Assignments issued in January 2008 that, insofar as it is practicable in the circumstances, the decision to vary or withdraw spectrum assignments to a carrier licence should be notified to the incumbent spectrum assignees at least three years in advance of the expiration of the assignment⁸.

⁶ The Spectrum Policy Framework is available at:
<http://www.cedb.gov.hk/ccib/eng/legco/pdf/spectrum.pdf>.

⁷ The TA Statement on Radio Spectrum Policy Framework is available at:
http://tel_archives.ofca.gov.hk/en/tas/others/ta20070424.pdf.

⁸ The TA Statement on Minimum Notice Periods for Variation or Withdrawal of Spectrum Assignments is available at:
http://tel_archives.ofca.gov.hk/en/tas/others/ta20080131.pdf.

FIRST ROUND OF PUBLIC CONSULTATION

12. The First Consultation Paper was published on 3 February 2016, with the following three options for the Re-assignment of the 900/1800 MHz Spectrum proposed for consultation –

- Option 1 – a full-fledged administratively-assigned approach that offers a right of first refusal to the incumbent spectrum assignees to acquire their current holding of the spectrum;
- Option 2 – a full-fledged market-based approach that re-assigns all the spectrum by way of auction; and
- Option 3 – a hybrid administratively-assigned cum market-based approach that re-assigns part of the spectrum to the incumbent spectrum assignees through the offer of a right of first refusal (i.e. the RFR Spectrum), with the remaining spectrum (together with any spectrum that may become available due to the decision of any incumbent spectrum assignee not to exercise their right of first refusal to take up the RFR Spectrum) to be re-assigned by way of auction (i.e. the Auctioned Spectrum).

13. In the First Consultation Paper, the CA conducted an evaluation of each proposed option against the multiple policy objectives for spectrum re-assignment, viz. –

- (a) ensuring customer service continuity;
- (b) efficient spectrum utilisation;
- (c) promotion of effective competition; and
- (d) encouragement of investment and promotion of innovative services.

The above objectives are the same as those that the CA adopted for the re-assignment of the spectrum in the 1.9 – 2.2 GHz band upon expiry of the

assignments in October 2016. As with the last re-assignment exercise, the CA made it clear in the First Consultation Paper that, for the current re-assignment exercise, it would choose the option that would best meet the four multiple objectives in spectrum re-assignment.

14. While the 900/1800 MHz Spectrum constitutes only 31% of the spectrum deployed for the provision of 3G and 4G services⁹, the provision of 2G services is supported solely by spectrum in the 900 MHz and 1800 MHz bands. Accordingly, in the first consultation, the CA sought the views and comments of the telecommunications industry and other affected persons on the need to ensure the continuing provision of 2G services for a certain period of time following the Re-assignment of the 900/1800 MHz Spectrum.

15. As regards SUF, SCED set out in the First Consultation Paper the principles and methods of setting the SUF under each of the three proposed spectrum re-assignment options, and sought the views and comments of the telecommunications industry and other affected persons. SCED made it clear that given that frequency spectrum was a scarce public resource, it was incumbent upon the Government to ensure that the SUF of spectrum was set to reflect as close as possible its full market value so that spectrum assignees, which ran their commercial operations in a fully liberalised market, would put the spectrum so acquired to its most efficient use.

16. The first round of public consultation lasted for three and a half months and ended on 18 May 2016, including a one-month extension in response to the requests of industry members. At the close of the consultation, a total of 325 submissions were received from the four MNOs, 19 commercial firms, a Legislative Council Member, two tourism organisations, and 299 members of the public¹⁰. Views and comments of the respondents were summarised in paragraphs 12 – 24 of the Second Consultation Paper, with the considerations and responses of the CA and SCED set out in paragraphs 25 – 71 and the Annex of that paper.

⁹ The application of radio spectrum in the provision of various generations of mobile services is given in Table 2 at **Annex 1**.

¹⁰ Submissions to the First Consultation Paper are available at:
http://www.coms-auth.hk/en/policies_regulations/consultations/completed/index_id_364.html.

SECOND ROUND OF PUBLIC CONSULTATION

17. The CA and SCED foreshadowed in the First Consultation Paper the likelihood that, after considering all the views and comments received in response to the consultation, they would put forward a more concrete proposal upon which they would invite further views and comments in the second round of public consultation. The Second Consultation Paper was published on 14 February 2017.

18. The CA expressed concern in the First Consultation Paper about the need to maintain continuity of 2G services and how this could be best achieved after the Re-assignment of the 900/1800 MHz Spectrum. The CA noted however from the submissions of the MNOs and other respondents that they were more concerned about the continuity of 3G and 4G services especially in the Mass Transit Railway (“MTR”), due to the long lead time required for the reconfiguration of the integrated radio systems (“IRS”) used for the provision of mobile services at the MTR premises to address changes in frequency assignments.

19. The CA, through OFCA, appointed the Consultant to conduct the Study on possible impact on service quality arising from the various spectrum re-assignment options proposed in the First Consultation Paper. The Consultant met with the four MNOs three times in 2016 to elaborate on the approach it would follow, collect historical and forecast data needed for developing the quantitative assessment model, and discuss with them the preliminary assessment results. The Consultant also held discussions with a mobile virtual network operator and the MTR Corporation. The results of the Study were summarised in paragraphs 31 – 43 of the Second Consultation Paper. A public version of the Study report was published on 14 February 2017 together with the Second Consultation Paper¹¹.

20. Having considered the views and comments received in the submissions to the First Consultation Paper, the findings of the Study, and having conducted a pros and cons evaluation of the three proposed options against the multiple objectives in spectrum re-assignment, the CA put forward in the Second

¹¹ The report of the Study entitled “*Technical Study in relation to the Re-assignment of Spectrum in the 900 MHz and 1800 MHz Bands upon Expiry of the Existing Assignments*” was published on 14 February 2017 together with the Second Consultation Paper, on OFCA’s website at: http://www.ofca.gov.hk/filemanager/ofca/common/reports/consultancy/cr_201702_01_en.pdf.

Consultation Paper a revised hybrid administratively-assigned cum market-based approach for further consultation. Under the revised hybrid option, it was proposed that 2 x 10 MHz of spectrum in the 1800 MHz band would be offered for re-assignment to each of the four incumbent spectrum assignees through the offer of a right of first refusal (i.e. 2 x 40 MHz of RFR Spectrum in total), while the remainder of the 900/1800 MHz Spectrum would be assigned by way of auction. Further views and comments of the telecommunications industry and other affected persons were sought on the revised hybrid option. SCED, having taken into account carefully the views and comments received from the first consultation, also proposed in the Second Consultation Paper, in respect of the revised hybrid option, the methods of setting the SUF of the Auctioned Spectrum and the RFR Spectrum, and the methodology for setting the auction reserve price for the Auctioned Spectrum as well as the minimum price and cap for the SUF of the RFR Spectrum.

21. The second round of public consultation was originally scheduled to close on 24 April 2017, but the deadline for submissions was extended by one month to 24 May 2017 in response to the requests of several industry participants. Accordingly, both the first and second consultations lasted for around three and a half months. Submissions to the Second Consultation Paper were received from 22 respondents, including the four MNOs, 12 commercial firms, an industry organisation, a consultant, and four members of the public¹².

22. It is noted that some respondents to the Second Consultation Paper made use of the opportunity to express their views and general comments on various issues. To the extent that those comments are of significance to consideration of the Re-assignment of the 900/1800 MHz Spectrum, they are addressed in this Statement. Other matters raised by the respondents are noted by the CA and SCED and will be considered to the extent to which they are relevant to other exercises which may be conducted separately from the Re-assignment of the 900/1800 MHz Spectrum and the related SUF.

23. Major views and comments pertaining to the objectives and approach of the Re-assignment of the 900/1800 MHz Spectrum and the arrangement for the SUF, and the responses of the CA and SCED are summarised in **Annex 2** attached to this Statement.

¹² Submissions to the Second Consultation Paper are available at:
http://www.coms-auth.hk/en/policies_regulations/consultations/completed/index_id_406.html.

THE CA'S EVALUATION OF THE REVISED HYBRID APPROACH AGAINST THE MULTIPLE OBJECTIVES IN THE RE-ASSIGNMENT OF THE 900/1800 MHz SPECTRUM

24. In the First Consultation Paper, the CA identified three possible options (see paragraph 12 above) for the Re-assignment of the 900/1800 MHz Spectrum. In the Second Consultation Paper, the CA, having taken into account the views and comments received from the first consultation as well as the findings of the Study, evaluated the three options against the multiple objectives in spectrum re-assignment, and reached the considered view that the hybrid administratively-assigned cum market-based approach (i.e. Option 3) would be the preferred approach to be put forward for further consultation, as it best meets the multiple objectives of spectrum re-assignment.

25. The CA expressed its opinion in the First Consultation Paper, which was affirmed in the Second Consultation Paper, that there would likely be competing demands for the 900/1800 MHz Spectrum from MNOs and potential new entrants upon expiry of the existing assignments¹³, given the continuously robust growth in mobile data usage, the superb propagation characteristics of the spectrum in the 900 MHz band, the 1800 MHz band being the core band for the provision of 4G services, and that the future supply of new spectrum would only be available at higher frequency bands. **The feedback received in response to the Second Consultation Paper supports the CA's view that there would likely be competing demands for the 900/1800 MHz Spectrum.** Applying the guiding principles in the Spectrum Policy Framework, where there is considered to be a likelihood of competing demands, a market-based approach should be adopted for the Re-assignment of the 900/1800 MHz Spectrum unless there are overriding public policy reasons to do otherwise.

26. One major public policy consideration justifying deviation from the full-fledged market-based approach is the need to ensure customer service continuity following the Re-assignment of the 900/1800 MHz Spectrum. In relation to this, the CA notes that the provision of 2G services throughout the

¹³ The preliminary view of the CA expressed in the First Consultation Paper that there was a likelihood of competing demands for the 900/1800 MHz Spectrum was not challenged by submissions received in response to the paper. The CA affirmed its view on the matter in the Second Consultation Paper. One MNO appeared to doubt the likelihood of competing demands for the 900/1800 MHz Spectrum in its submission in response to the Second Consultation Paper and asked the CA to prove that the actual demand for it exceeded its supply. For the CA's considerations and responses on this issue, please refer to Section 6 of **Annex 2**.

territory is supported solely by the 900/1800 MHz Spectrum. The 1800 MHz band is also the primary frequency band supporting the provision of 4G services in some of the MTR stations and the adjoining tunnel areas. The CA understands from the industry that there are 43 MTR stations (“Remaining MTR Stations”) where the IRS are not expected to be upgraded in or before 2020/21 (a) to include the 2.3 GHz and 2.5/2.6 GHz bands as the additional spectrum for providing 4G services; and (b) to install the frequency agile equipment supporting flexible and efficient system reconfiguration in case of variations in frequency assignments by the time the 900/1800 MHz Spectrum is re-assigned¹⁴. Therefore, if all the 900/1800 MHz Spectrum were to be re-assigned by way of auction (i.e. Option 2) and any of the MNOs are not able to retain the part of their respective frequency holdings in the 1800 MHz band which is used for the provision of 4G services at the MTR premises, the provision of 4G services in the Remaining MTR Stations will be at risk. Therefore, **the CA considers that the need to ensure customer service continuity in relation to 2G services and the provision of 4G services in the Remaining MTR Stations amounts to an overriding public policy reason to deviate partially from the full-fledged market-based approach (Option 2).**

27. Although Option 1 would address the concerns regarding customer service continuity, as the CA has pointed out in the First Consultation Paper and reiterated in the Second Consultation Paper, it is not the preferred approach as it is less optimal for meeting the other objectives adopted by the CA for evaluation of the identified options.

28. Although the hybrid approach was put forward as the preferred approach for further consultation in the Second Consultation Paper, some MNOs and other industry parties still maintained in their submissions that Option 1 should be used. Taking these views into account, the CA has focused, as follows, on evaluating the hybrid approach (Option 3) as compared with the full-fledged administratively-assigned approach (Option 1) in order to come to a view on which approach would best meet the multiple objectives in spectrum re-assignment.

¹⁴ For details about the arrangements for the provision of mobile services in all the 94 MTR stations, including the nine MTR stations opened in 2016 and the 18 MTR stations where the IRS upgrade works are expected to be completed by 2019, please see paragraphs 39–41 of the Second Consultation Paper.

Ensuring Customer Service Continuity

29. Insofar as customer service continuity is concerned, the Re-assignment of the 900/1800 MHz Spectrum will have an impact on the provision of 2G services in the whole territory. It is not expected to affect the provision of 3G services in general since 3G services are primarily provided by using the spectrum in the 1.9 – 2.2 GHz band. In relation to the provision of 4G services in areas other than the Remaining MTR Stations, given that spectrum in the 1.9 – 2.2 GHz, 2.3 GHz and 2.5/2.6 GHz bands is also used by MNOs for 4G services, it is not expected that the provision of 4G services will be affected by the present spectrum re-assignment exercise. In addition, the findings of the Study reveal no general adverse impact on service quality post spectrum re-assignment, except for the possible marginal service degradation in high traffic areas on the 3G network of an MNO in 2021, and on the 4G networks of this and another MNO in 2023 if some of the 900/1800 MHz Spectrum is acquired by a new entrant. The marginal service degradation could be effectively mitigated by the affected MNOs implementing remedial measures such as migrating more 3G traffic to the 4G network, increasing the number of antenna sectors and offloading more traffic to the Wi-Fi networks¹⁵.

30. The above analysis demonstrates that if 2 x 10 MHz of spectrum in the 1800 MHz band is to be re-assigned to each of the incumbent spectrum assignees through the offer of a right of first refusal under the revised hybrid approach (i.e. Option 3 as proposed in the Second Consultation Paper), it can be expected to adequately address the concerns about customer service continuity in relation to the 4G services at the MTR premises, particularly in the Remaining MTR Stations, as well as the continuous provision of 2G services in the territory.

31. Whilst, as some of the respondents submitted, customer service continuity can be achieved by maintaining the status quo and allowing the MNOs to continue using their assigned spectrum, such as through the full-fledged administratively-assigned approach (Option 1), it is not the only option that can

¹⁵ In their submissions to the Second Consultation Paper, some of the respondents commented on the report of the consultancy study released on 14 February 2017 together with the Second Consultation Paper. The responses of the Consultant to the views and comments on the Study report are provided in the paper “*Response to Views and Comments on the Technical Study Conducted by Plum Consulting in the Submissions to the Second Consultation on the Arrangements for the Frequency Spectrum in the 900 MHz and 1800 MHz Bands upon Expiry of the Existing Assignments for Public Mobile Telecommunications Services and the Spectrum Utilisation Fee*”, which is published today together with this Statement and is available at: http://www.ofca.gov.hk/filemanager/ofca/common/reports/consultancy/cr_201712_19_en.pdf.

be expected to meet the objective of ensuring customer service continuity. The CA is of the view that the revised hybrid approach (Option 3) can also be expected to achieve this objective effectively.

32. Please refer to paragraphs 2.5 – 2.12 of **Annex 2** for detailed responses of the CA to the views and comments in the submissions to the Second Consultation Paper on which of the proposed options is expected to best satisfy the spectrum re-assignment objective of ensuring customer service continuity.

Efficient Spectrum Utilisation

33. The revised hybrid approach (Option 3) is expected to directly enhance the efficiency in spectrum utilisation in a number of ways. First, Option 3, embodying an element of auction, can best ensure that 60% of the 900/1800 MHz Spectrum through the competitive bidding process will be put into the hands of those MNOs and/or new entrants which value it the most and can be expected to put it to the most efficient use during the term of the licence. Second, Option 3 allows for the currently fragmented frequency slots (in the range of 2 x 0.8 MHz to 2 x 3.2 MHz) in the two frequency bands, which were assigned in the 1980s and the 1990s for the provision of voice services, to be consolidated into frequency slots of 2 x 5 MHz or 2 x 10 MHz before re-assignment. Carrier bandwidths of these sizes are compatible with the 3G and 4G technologies, and this will also likely to be the case for the fifth generation (“5G”) technology in the future. Re-assignment of the 900/1800 Spectrum in this way would ensure efficient utilisation of the spectrum in the new term. Third, Option 3, embodying an element of auction, allows MNOs, after reviewing their entire portfolios of spectrum holdings and the service demands of their subscribers, to decide to bid for more, less or the same amount of spectrum in the two frequency bands with a view to enhancing the efficiency in the deployment of spectrum on their networks. This includes the opportunity for MNOs to attain a frequency slot of up to 2 x 20 MHz in the 1800 MHz band through bidding, which will likely enable higher spectral efficiency on its own and in carrier aggregation using the 4G Long Term Evolution (“LTE”) technology.

34. The full-fledged administratively-assigned approach (Option 1), on the other hand, preserves the status quo. With the perpetuation of the currently fragmented spectrum assignments, it will inhibit refarming of the spectrum for

the provision of 3G services (requiring a typical carrier bandwidth of 5 MHz) and 4G services (requiring carrier bandwidths of 1.4, 3, 5, 10, 15 or 20 MHz), rendering it very difficult, if not impossible, for incumbent assignees to achieve a more efficient use of the same amount of spectrum during the new assignment term. Option 1, which does not involve competitive bidding for spectrum, will unlikely lead to an allocation of the 900/1800 MHz Spectrum which is fair, reasonable and efficient in such manner as outlined above as in the case of Option 3, although the keen market competition would go some way towards encouraging efficient spectrum use. Against the above, Option 1 is inferior to Option 3 in meeting the objective of promoting more efficient distribution and utilisation of spectrum among operators.

35. For details about the responses of the CA to the views and comments in the submissions to the Second Consultation Paper on which of the proposed options could be expected to promote efficient spectrum utilisation, please refer to paragraphs 3.4 – 3.12 of **Annex 2**.

Promotion of Effective Competition

36. While noting that the mobile telecommunications market in Hong Kong is highly competitive with four MNOs serving a population of 7.4 million at a mobile penetration rate of 243%, the objective of promoting effective competition should not simply be equated with the introduction of new entrants, which should be determined by the market. The possibility of there being new entrants could be the outcome of a competitive auction of spectrum conducted under the revised hybrid approach of Option 3. The CA is of the view that in a free market, without any pre-set limit on the number of mobile licences, the optimal number of players in the market should be determined by market forces.

37. Apart from providing the opportunity for new market entrants, Option 3, by making available a minimum of 120 MHz of spectrum for competitive bidding by any interested party, is expected to enhance competition in the mobile telecommunications market by enabling MNOs to bid for the additional spectrum they need in order to compete more effectively through the provision of better quality services, the introduction of more innovative services and/or the deployment of more advanced technologies such as the forthcoming 5G technology.

38. By comparison, the full-fledged administratively-assigned approach of Option 1 will at best maintain the prevailing market situation and competition relationship among MNOs. It will not generate opportunities to enhance competition through either the entry of new operators or more optimal distribution of spectrum among the incumbent MNOs. Option 3 clearly outperforms Option 1 in meeting the objective of enhancing competition.

39. Some respondents submitted that spectrum trading would be a more efficient approach to facilitate the entry of new players and competition. It has to be pointed out that, as a matter of policy, spectrum trading is not permitted in Hong Kong. It is, therefore, not a relevant consideration for the CA's assessment of the options for the Re-assignment of the 900/1800 MHz Spectrum.

40. For further views of the CA in regard to promotion of effective competition in the Re-assignment of the 900/1800 MHz Spectrum and of the Government on spectrum trading, please refer to paragraphs 4.4 – 4.10 of **Annex 2**.

Encouragement of Investment and Promotion of Innovative Services

41. Under the revised hybrid approach of Option 3, the offer of the 2 x 40 MHz of RFR Spectrum in the 1800 MHz band to the incumbent spectrum assignees, if so accepted, would provide certainty to the MNOs and enable them to continue to invest in order to effectively utilise the spectrum and/or aggregate it with spectrum in other frequency bands for better service provision. With the auction to be conducted in about a year's time from the promulgation of the CA's decision on the re-assignment arrangements, MNOs would be certain about the amount of 900/1800 MHz Spectrum they are going to hold in the new assignment term once the auction outcomes are known. They can then continue to invest so as to put the spectrum into effective use. The new entrants, if any, are expected to bring additional investment to the local telecommunications market, particularly in developing the necessary network infrastructure for effective deployment of the newly acquired spectrum. Any adjustment to the holdings of spectrum of the incumbent assignees and participation of new entrants in the market resulting from the auction outcome will spur competition and the development of innovative services, which will benefit the mass of mobile users.

42. Comparing Option 1 and Option 3, Option 1 has merit in the short

term of providing a more stable business environment with certainty in spectrum holdings than Option 3. The CA recognises that there may be some business uncertainty for the MNOs under Option 3 during the period between the promulgation of the CA's decision and the completion of the auction of the Auctioned Spectrum. The CA notes however that it will be just a short period of time of about one year. On the other hand, Option 1 is unlikely to give rise to additional investment and development of innovative services by MNOs, which is likely to flow from the adoption of Option 3. On balance, the CA considers that Option 3 has more merits than Option 1 as far as stimulation of investment and development of innovative services are concerned.

43. Please refer to paragraphs 5.4 – 5.12 of **Annex 2** for detailed responses of the CA to the submissions to the Second Consultation Paper concerning which of the proposed options can be expected to best achieve the objective of encouragement of investment and promotion of innovative services in spectrum re-assignment.

44. Having considered the analysis of the relative pros and cons of the two options summarised above, the CA's considered view is that Option 3 can best meet the multiple objectives of spectrum re-assignment which it has identified and should be adopted over Option 1 (and Option 2).

THE DECISION OF THE CA ON THE ARRANGEMENTS FOR THE RE-ASSIGNMENT OF THE 900/1800 MHZ SPECTRUM

Approach of Spectrum Re-assignment

45. Having carefully considered the views and comments received in the two rounds of public consultation conducted during 2016 and 2017; the analysis and recommendation of the Consultant; the overriding public policy reasons for deviating from a market-based approach; and the above pros and cons analysis of the re-assignment options against the multiple objectives in spectrum re-assignment, **the CA has decided to adopt the hybrid administratively-assigned cum market-based approach as proposed in the Second Consultation Paper for the re-assignment of the 50 MHz of spectrum in the 900 MHz band and 150 MHz of spectrum in the 1800 MHz band upon the expiry of their existing assignments within the period between November 2020 and January 2021 and in September 2021 respectively.**

46. The CA's decision on the arrangements for the Re-assignment of the 900/1800 MHz Spectrum comprises the following elements –

- (a) **each of the four incumbent spectrum assignees is to be offered a right of first refusal to be assigned 2 x 10 MHz of spectrum in the 1800 MHz band, i.e. a total of 2 x 40 MHz (or 40% of the 900/1800 MHz Spectrum) is to be re-assigned as the RFR Spectrum; and**
- (b) **the remaining spectrum in the 1800 MHz band and all the spectrum in the 900 MHz band is to be assigned by way of auction, i.e. a total of 2 x 60 MHz (or 60% of the 900/1800 MHz Spectrum) is to be auctioned.**

If any incumbent spectrum assignee decides not to exercise the right of first refusal to take up the RFR Spectrum, the spectrum becoming available in the 1800 MHz band will be pooled together with the non-RFR Spectrum to be released by the incumbent spectrum assignees upon expiry of their existing assignments and this will form the Auctioned Spectrum for re-assignment by way of auction.

47. The offer of a right of first refusal to each of the incumbent spectrum assignees of 2 x 10 MHz of spectrum in the 1800 MHz band will provide the spectrum required for safeguarding the provision of 4G services in the Remaining MTR Stations and the provision of territory-wide 2G services. From the CA's perspective, the sole premise for the offer to re-assign a certain amount of RFR Spectrum to each incumbent spectrum assignee is to address the need to preserve continuity of customer services, and the amount should be aligned at the same minimum level to achieve the purpose. Those MNOs which possess a larger number of customers with heavy demand for data services may bid for additional spectrum in the auction or implement necessary measures to ensure the offer of quality services to their customers.

48. Following the general approach adopted towards assignment of spectrum in other frequency bands for the provision of public mobile telecommunications services, both the RFR Spectrum and the Auctioned Spectrum will be assigned based on the principle of technology neutrality. At

any time during the new term of the spectrum assignments, MNOs will be free to refarm the spectrum for more advanced uses, in tandem with the developments in mobile technologies, for the achievement of a higher transmission capacity and better business potential based on their commercial considerations.

Re-assignment of Some of the 900/1800 MHz Spectrum for Coverage in Country Parks and Remote Areas

49. Among the 900/1800 MHz Spectrum, 2 x 4.8 MHz in the frequency range of 1780.1 – 1784.9 MHz paired with 1875.1 – 1879.9 MHz has been designated as a frequency band for which no SUF is payable for the spectrum in that band if it is used for the provision of mobile coverage in the country parks and remote areas specified as the designated areas¹⁶ (“Country Park Frequencies”). Part of that spectrum is currently assigned to three MNOs (viz. CMHK, HKT and SmarTone).

50. In order to ensure continuous provision of mobile service coverage in the designated areas particularly for the support of emergency communications, the CA and SCED have respectively decided to administratively re-assign the part of the Country Park Frequencies already so assigned to the three incumbent spectrum assignees and to continue not to charge SUF for use of these frequencies to provide mobile coverage in the designated areas in the new term of assignment.

51. The arrangements for assignment of the 2 x 4.8 MHz of spectrum for use in areas other than the designated areas will follow the decision of the CA on the Re-assignment of the 900/1800 MHz Spectrum as set out in paragraphs 45 – 46 above. As shown in Table 2 under paragraph 78 below, spectrum in the frequency range of 1780.1 – 1784.9 MHz paired with 1875.1 – 1879.9 MHz within frequency slot A4 will be assigned by way of auction. It will be assigned to the successful bidder of the relevant frequency slot for the provision of mobile telecommunications services in areas other than the designated areas, unless otherwise approved by the CA.

¹⁶ The country parks and remote areas concerned were specified by the former TA as designated areas in the gazette notice G.N.2068 of 2009.

DESIGNATION OF FREQUENCY BANDS IN WHICH THE USE OF SPECTRUM IS SUBJECT TO PAYMENT OF SUF

52. At present, the entire 900 MHz band (i.e. spectrum in the frequency range of 890 – 915 MHz paired with 935 – 960 MHz) (“900 MHz Spectrum”) and frequencies in the range of 1710.5 – 1784.9 MHz paired with 1805.5 – 1879.9 MHz in the 1800 MHz band are already designated under the Telecommunications (Designation of Frequency Band subject to Payment of Spectrum Utilization Fee) Order (Cap. 106Y) as frequency bands in which the use of spectrum is subject to the payment of SUF. However, the currently vacant spectrum of 2 x 0.6 MHz at the margins of the 1800 MHz band, comprising 2 x 0.5 MHz of spectrum in the frequency range of 1710.0 – 1710.5 MHz paired with 1805.0 – 1805.5 MHz, and 2 x 0.1 MHz of spectrum in the frequency range of 1784.9 – 1785.0 MHz paired with 1879.9 – 1880.0 MHz, is not designated under Cap. 106Y as frequency bands subject to the payment of SUF (together with spectrum in the 1800 MHz band already so designated, collectively referred to as “1800 MHz Spectrum”). As such, the CA has decided to propose for an order to be made under Section 32I(1) of the TO to include this 2 x 0.6 MHz of spectrum in the 1800 MHz band as one of the designated bands under Cap. 106Y in which the use of spectrum is subject to the payment of SUF.

CONSIDERATIONS OF SCED ON SUF

53. The CA has decided to adopt a hybrid administratively-assigned cum market-based approach, under which 2 x 40 MHz of spectrum in the 1800 MHz band will be re-assigned to the incumbent spectrum assignees through the offer of a right of first refusal, and the remaining spectrum in the 1800 MHz band and all the spectrum in the 900 MHz band will be assigned by way of auction. Following on from the above, the entire 900 MHz and 1800 MHz bands will be designated by the CA under Cap. 106Y as frequency bands in which the use of spectrum is subject to the payment of SUF. Pursuant to section 32I(2) of the TO, SCED may by regulation prescribe the level of the SUF, or the method for determining the SUF, of the 900/1800 MHz Spectrum.

54. Given that frequency spectrum is a scarce public resource, it is incumbent upon the Government to ensure that the SUF of spectrum is set to reflect as close as possible its full market value so that spectrum assignees, which

run their commercial operations in a fully liberalised market, would put the spectrum so acquired to its most efficient use.

55. Taking into account the relevant comments received in the two rounds of public consultation, SCED has decided to propose a regulation under section 32I(2) of the TO to prescribe the method for determining the SUF of the 900/1800 MHz Spectrum for the next 15-year assignment term as set out in paragraphs 56 – 71 below. SCED’s responses to the submissions to the Second Consultation Paper in relation to SUF are detailed in paragraphs 7.12 – 7.27 of **Annex 2**.

SUF of the Auctioned Spectrum

56. For the Auctioned Spectrum, its SUF would naturally be determined through auction whereby the bidders would determine the level of their bids based on clear information on the supply of spectrum and their assessment of the business potential and opportunities. The auction results would reflect the full market value of the Auctioned Spectrum. SCED has decided to propose a regulation under section 32I(2) of the TO to prescribe that **the respective SUF of the Auctioned Spectrum in the 900 MHz and 1800 MHz bands be determined by auction, subject to an auction reserve price that he specifies**.

57. It is not intended for the auction reserve price to be set as a pre-estimate of an expected market price. Rather, it should be set at a level that represents the minimum base value of the spectrum for the purpose of kick-starting the competitive bidding process.

58. While the propagation characteristics of spectrum in the 900 MHz band may be more superior than those in the 1800 MHz band, SCED notes that given the common availability of band equipment and user devices supporting the 1800 MHz band for the provision of 4G services, the 900 MHz Spectrum and the 1800 MHz Spectrum may be equally or similarly attractive to the industry. SCED has therefore decided to set just one auction reserve price for spectrum in both the 900 MHz and 1800 MHz bands. After all, the market value of the spectrum will be determined through the competitive bidding process.

59. In the Second Consultation Paper, SCED proposed that in setting the auction reserve price, reference should be made to the auction reserve prices for

the two most recent auctions in respect of the 50 MHz of spectrum in the 2.5/2.6 GHz band and the 49.2 MHz of spectrum in the 1.9 – 2.2 GHz band (“3G Spectrum”) conducted in March 2013 and December 2014 respectively, i.e. \$15 million and \$48 million per MHz respectively then, and equivalent to \$19 million and \$54 million per MHz respectively at 2021 price level having adjusted for inflation. SCED then considered that between the two, the auction of the 3G Spectrum carried relatively a greater reference value than that in the 2.5/2.6 GHz band for two reasons. First, both the 900/1800 MHz Spectrum and 3G Spectrum have been used for the provision of public mobile telecommunications services in the whole territory including all stations along the MTR lines, whereas spectrum in the 2.5/2.6 GHz band has yet to be fully deployed along the MTR lines. Second, the auction of the 3G Spectrum was conducted more recently in 2014. SCED therefore proposed then that the auction reserve price may be set between \$19 million and \$54 million per MHz, and his inclination was that the final value would be closer to the higher end.

60. While SCED remains of the view that the auction of the 3G Spectrum carries relatively a greater reference value, he notes that for the present re-assignment exercise, at least 120 MHz of spectrum, among the largest lot for release through auction in one go since the promulgation of the Spectrum Policy Framework in 2007, would be made available for competitive bidding, and hence he is conscious of the effect the release of such a large quantum of spectrum through auction would have on its market value. Further, SCED has taken note of the views in some submissions that the MNOs’ ability and willingness to invest in new and innovative technologies should be taken into account when setting the SUF. In particular, SCED notes that with the anticipated launch of 5G services in around 2020, MNOs will need to invest substantial resources into constructing the relevant infrastructure, which will have an impact on their budgetary planning and financial arrangements as regards the competitive bidding for the 900/1800 MHz Spectrum in the current exercise.

61. Having considered the above, SCED has decided that the auction reserve price for spectrum in both the 900 MHz and 1800 MHz bands should be set above, but closer to the average of the two reference values of \$19 million and \$54 million per MHz, rather than closer to the higher end. After careful consideration, **he considers it appropriate to set the auction reserve price at \$38 million per MHz.**

SUF of the RFR Spectrum

62. The Spectrum Policy Framework states that for spectrum not released through auction or other market mechanisms, without affecting any of the powers of SCED, the SUF may be set to reflect the opportunity costs of the spectrum. The 2 x 40 MHz of spectrum in the 1800 MHz band, which constitutes the RFR Spectrum that will be re-assigned to the incumbent spectrum assignees if they exercise the right of first refusal, falls squarely within the category of spectrum not released through market mechanism.

63. Since the RFR Spectrum falls in the 1800 MHz band, SCED only needs to prescribe the method for determining the SUF of the RFR Spectrum in the 1800 MHz band.

64. To ensure efficient spectrum utilisation, SCED is of the view that SUF of the RFR Spectrum should be set as close as possible to its full market value. In this respect, the outcome of the auction of the 70 MHz of Auctioned Spectrum in the 1800 MHz band should naturally be the best available indicator of the full market value of the RFR Spectrum for the next assignment term. This is so as the market value of different parts of the spectrum in the same frequency band should be very close to, if not the same as, each other. **SCED accordingly considers it appropriate to set the SUF of the RFR Spectrum at the average SUF of the Auctioned Spectrum in the 1800 MHz band, subject to a minimum price and a cap.**

65. The minimum price for the RFR Spectrum is the minimum fee an incumbent spectrum assignee has to pay to be entitled, and to be able to exercise the right of first refusal to be re-assigned part of its current spectrum holdings. SCED has elaborated in the Second Consultation Paper that the estimated market value of spectrum in the 1800 MHz band should be close to the value of spectrum in frequency bands with similar propagation characteristics as determined in assignments conducted in recent years, and therefore, in setting the minimum price, reference should be made to the level of SUF for spectrum in the 2.5/2.6 GHz band as determined by auction conducted in March 2013, and that for 3G Spectrum (including spectrum assigned through the offer of a right of first refusal and by way of auction) as determined in the re-assignment exercise in 2014, i.e. \$30.8 million and \$59 million per MHz respectively then, and equivalent to \$38 million and \$67 million per MHz respectively at 2021 price

level having adjusted for inflation. Similar to the auction reserve price, SCED proposed then that the minimum price for the RFR Spectrum may be set between the two reference values, i.e. \$38 million and \$67 million per MHz, and his inclination was that the final value would be closer to the higher end.

66. For the same reasons as mentioned in paragraph 60 above, in view of the substantial investment commitments MNOs are facing in constructing the infrastructure in preparation for the launch of 5G services, SCED has decided that the minimum price for RFR Spectrum should be set above, but closer to the average of the two reference values of \$38 million and \$67 million per MHz, rather than closer to the higher end. After careful consideration, he considers it appropriate to set the minimum price at \$54 million per MHz.

67. Regarding the cap for the RFR Spectrum, having considered the relevant factors, including the estimated market value of spectrum in the 1800 MHz band, the need to provide a level playing field for the incumbent spectrum assignees and the successful bidders of the Auctioned Spectrum, as well as the need to address the concern of the incumbent spectrum assignees over the lack of certainty by the dependence of the SUF of the RFR Spectrum on that of the Auctioned Spectrum, SCED considers it appropriate to set the cap at \$70 million per MHz.

68. On the basis of the above, SCED has decided to propose a regulation under section 32I(2) of the TO to prescribe that **the SUF per MHz of the RFR Spectrum for the next 15-year assignment term will be the higher of \$54 million at 2021 price level or the average SUF per MHz of the Auctioned Spectrum in the 1800 MHz band as determined by auction, subject to a cap of \$70 million.**

Method of Payment

69. The current re-assignment exercise involves a total of 200 MHz of spectrum, which is more than that in the last re-assignment exercise (namely the re-assignment for 3G Spectrum in 2016) by some 80 MHz, or 69%. The amount of SUF involved is potentially substantial. There is a need to allow for greater flexibility for spectrum assignees to make financial arrangement for the payment of SUF having regard to their individual circumstances. In view of the above, SCED proposed in the Second Consultation Paper that spectrum assignees would

be given a choice to pay the SUF either by lump sum payment upfront or annual instalments. All MNOs welcome the option of paying the SUF by annual instalments. SCED has decided to propose a regulation under section 32I(2) of the TO to prescribe that all **spectrum assignees** (which may include the MNOs and new entrants into the market) **will be given a choice to pay the SUF either by –**

- (a) **lump sum payment upfront**, which is the lump sum amount obtained in auction and/or via right of first refusal as elaborated in paragraphs 56 – 68 above; or
- (b) **annual instalments**, with the first instalment equivalent to the lump sum amount obtained in (a) above divided by 15 (i.e. the number of years of assignment), and subsequent instalments increased every year by 2.5%, the latest medium-range underlying inflation forecast, to reflect the time value of money to the Government.

If a spectrum assignee chooses to pay the SUF by annual instalments, the Government would require a five-year rolling guarantee of the SUF payment throughout the whole assignment period.

70. The regulation referred to in paragraphs 56, 68 and 69 will be tabled at the Legislative Council for negative vetting.

71. As to the annual royalty payment approach proposed by some MNOs, please refer to paragraph 7.26 of **Annex 2** for reasons why the approach is not adopted for the re-assignment exercise.

Tax Deductibility of SUF

72. On the issue of tax deductibility as mentioned in some of the submissions received, this is fundamentally a matter of tax policy separate from and independent of SCED's decisions on the method for determining the levels of SUF and method of payment. Inland Revenue Department has confirmed that SUF will be regarded as capital expenditure and hence not tax deductible irrespective of the method of payment (i.e. either in form of lump sum payment or annual instalments). If MNOs have any enquiries on this issue, they should

seek the advice of their own tax advisors and take such advice into consideration when making decisions relating to their investment in the present spectrum re-assignment exercise.

73. Nothing in this Statement will affect, limit or prejudice the exercise of the powers by SCED under the TO or its subsidiary legislation.

DETAILED ARRANGEMENTS FOR SPECTRUM RE-ASSIGNMENT

74. The detailed arrangements for the spectrum re-assignment cover the band plans for spectrum re-assignment, the auction rules and the licensing arrangements, which are described in the following sections.

Band Plans for Spectrum Re-assignment

75. The adoption of the hybrid approach for the Re-assignment of the 900/1800 MHz Spectrum means that the spectrum to be re-assigned will be under two categories, viz. the RFR Spectrum and the Auctioned Spectrum. In view of the currently fragmented spectrum assignments in both the 900 MHz and the 1800 MHz bands, as well as the ever increasing demand for capacity for the provision of high speed and innovative mobile broadband services, the CA has decided to re-organise the band plans for both frequency bands before the re-assignment so as to promote higher spectral efficiency. The newly designed band plans are set out in the following paragraphs.

Band Plan for the 1800 MHz Band

76. Taking into account the carrier bandwidths which are supported by the existing mobile technologies, **the CA has decided to re-organise the band plan for the 2 x 75 MHz of spectrum in the 1800 MHz band into seven designated frequency slots of 2 x 10 MHz each and one designated frequency slot of 2 x 5 MHz.** At present, the 3G technology typically requires a carrier bandwidth of 5 MHz, while the 4G technology supports a range of carrier bandwidths in terms of 1.4, 3, 5, 10, 15 or 20 MHz. In general, carriers with larger bandwidths deliver a higher level of spectral efficiency. It will be up to individual bidders in the auction to be held for the Auctioned Spectrum to bid for the appropriate number of frequency slots and form blocks of larger bandwidths to support high speed and spectrally efficient transmission.

77. In addition, the CA's re-assignment of the four frequency slots of 2 x 10 MHz each (as shown in Table 1 below) to the incumbent spectrum assignees through the offer of a right of first refusal basically follows the assignments they currently deploy for the provision of 4G services at the MTR premises¹⁷. This will ensure the continuity of 4G services in the Remaining MTR Stations following the re-assignment of the spectrum in the 1800 MHz band in 2021.

Table 1: RFR Spectrum

Frequency slot	Incumbent spectrum assignee	Frequency range (MHz)	Bandwidth
R1	HKT	1720 – 1730 paired with 1815 – 1825	2 x 10 MHz
R2	SmarTone	1740 – 1750 paired with 1835 – 1845	2 x 10 MHz
R3	CMHK	1750 – 1760 paired with 1845 – 1855	2 x 10 MHz
R4	Hutchison	1760 – 1770 paired with 1855 – 1865	2 x 10 MHz

78. If all the incumbent spectrum assignees exercise their right of first refusal to acquire 2 x 10 MHz of RFR Spectrum, a total of 2 x 35 MHz of spectrum in the 1800 MHz band as shown in Table 2 below will be available for assignment by way of auction. Unless otherwise approved by the CA, 2 x 4.8 MHz of spectrum in the frequency range of 1780.1 – 1784.9 MHz paired with 1875.1 – 1879.9 MHz within frequency slot A4 will be assigned to the successful bidder for the provision of mobile telecommunications services in areas other than the designated areas (see paragraphs 49 – 51 above).

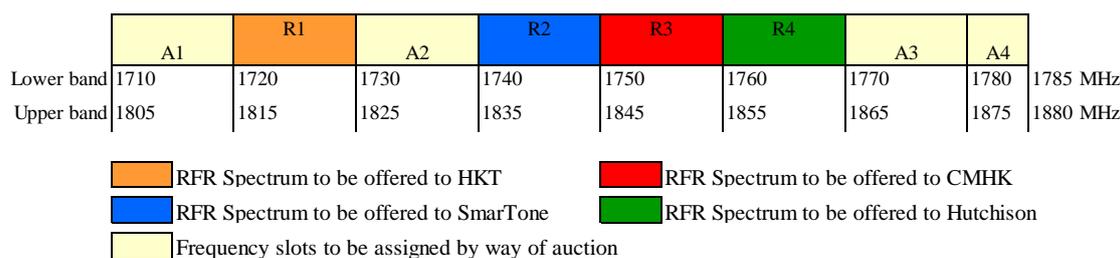
¹⁷ For better spectrum management, the entire band plan for the 1800 MHz band is redrawn, including that for the six frequency slots of 2 x 10 MHz each in the middle of the band plan at present, such that the frequency boundaries of all the slots start and end at integer values.

Table 2: Auctioned Spectrum in the 1800 MHz Band

Frequency slot	Frequency range (MHz)	Bandwidth
A1	1710 – 1720 paired with 1805 – 1815	2 x 10 MHz
A2	1730 – 1740 paired with 1825 – 1835	2 x 10 MHz
A3	1770 – 1780 paired with 1865 – 1875	2 x 10 MHz
A4	1780 – 1785 paired with 1875 – 1880	2 x 5 MHz

79. Taking the RFR Spectrum and the Auctioned Spectrum together, the new band plan, after consolidating the currently fragmented frequency slots at the two ends of the 1800 MHz band, is shown in Figure 1 below. It is designed in such a way that there is an opportunity for more MNOs to acquire a contiguous frequency block of 2 x 20 MHz, which is the maximum carrier bandwidth for the 4G technology, as compared with the status quo. Spectrum assignees may also aggregate carriers from the same and/or different frequency bands to enhance the capacity for the attainment of even higher transmission speeds.

Figure 1: Band Plan for the 1800 MHz Frequency Band



80. The opportunity to achieve a contiguous frequency slot of 2 x 20 MHz may not be the same for every incumbent spectrum assignee and it will depend on whether or not they will exercise their right of first refusal to acquire the RFR Spectrum. Given the need to safeguard the provision of 4G services in the Remaining MTR Stations, swapping of the frequency assignments of the RFR Spectrum within the 1800 MHz band among the assignees will generally not be allowed unless the assignees applying for frequency swap can demonstrate to the satisfaction of the CA that other frequency bands such as the

2.3 GHz and 2.5/2.6 GHz bands have already been deployed or the frequency agile equipment has already been installed in the Remaining MTR Stations such that the provision of 4G services in those stations will not be affected by any consequential variations in the assignments of spectrum in the 1800 MHz band. Further, swapping of all the frequency assignments within the 1800 MHz band in the first five years of the new assignment term will generally not be allowed. This should generate effective competitive bidding for the individual frequency slots according to the quantity of spectrum and position of the frequency slots demanded by the bidders. Hence the full market value of each individual frequency slot should be realised in the auction.

Band Plan for the 900 MHz Band

81. Similar considerations apply to the 900 MHz band and therefore **the CA has similarly decided to re-organise the band plan for the 2 x 25 MHz of spectrum in the 900 MHz band into five designated frequency slots of 2 x 5 MHz each.** This approach is considered appropriate in view of the scarcity of the sub-1 GHz spectrum and the already satisfactory performance of a 2 x 5 MHz slot in providing service coverage. As all the spectrum in the 900 MHz band will be assigned by way of auction under the hybrid approach, there will be five slots of Auctioned Spectrum, as shown in Table 3 below.

Table 3: Auctioned Spectrum in the 900 MHz Band

Frequency slot	Frequency range (MHz)	Bandwidth
B1	890 – 895 paired with 935 – 940	2 x 5 MHz
B2	895 – 900 paired with 940 – 945	2 x 5 MHz
B3	900 – 905 paired with 945 – 950	2 x 5 MHz
B4	905 – 910 paired with 950 – 955	2 x 5 MHz
B5	910 – 915 paired with 955 – 960	2 x 5 MHz

82. The new band plan, with the currently fragmented slots in the 900 MHz band consolidated, is shown in Figure 2 below. Similar to the 1800 MHz band, it provides the opportunity for bidders to bid for more frequency slots to form contiguous blocks of larger bandwidths, subject to the spectrum sub-cap which will be imposed in the auction as set out in paragraph 89 below. Swapping of the frequency assignments within the 900 MHz band in the first five years of the new assignment term will in general not be allowed by the CA, which is similar to the restriction imposed for the spectrum in the 1800 MHz band.

Figure 2: Band Plan for the 900 MHz Frequency Band

	B1	B2	B3	B4	B5	
Lower band	890	895	900	905	910	915 MHz
Upper band	935	940	945	950	955	960 MHz

 Frequency slots to be assigned by way of auction

Auction Rules

83. With the adoption of the hybrid approach for spectrum re-assignment, 50 MHz of spectrum in the 900 MHz band and a minimum of 70 MHz of spectrum in the 1800 MHz band will be available for auction. Subject to the completion of the legislative process to amend the subsidiary legislation for the setting of the SUF of the RFR Spectrum, the CA expects to offer to the incumbent spectrum assignees the right of first refusal for re-assignment of the RFR Spectrum in the second half of 2018. The total amount of spectrum to be put to auction can be confirmed once the incumbent MNOs have made their decisions on whether or not to accept the offer. **The CA intends to conduct a single spectrum auction for the assignment of the Auctioned Spectrum**, which will enable bidders to bid for the spectrum in the two frequency bands in one go. Section 32I(4) of the TO empowers the CA to specify the terms and conditions of an auction, and this will be done after enactment of the relevant subsidiary legislation.

84. Taking into account the preparatory work required to implement the decisions of the CA and SCED in relation to the RFR Spectrum and Auctioned Spectrum, including amendments of the subsidiary legislation; gazettal of the auction reserve prices and the terms and conditions of the auction; issue of the information memorandum for auction; invitation for bidding; etc., the auction is

expected to be conducted around the end of 2018. This will provide incumbent MNOs and new spectrum assignees a transitional period of about two years following completion of the auction to reconfigure their existing networks and/or to roll out a new network infrastructure, as the case may be, so that the Auctioned Spectrum could be put to immediate use at the beginning of the new term of the spectrum assignments.

Eligible Bidders

85. As proposed in the two rounds of public consultation and having regard to the feedback received, **the CA has decided that the auction for the Re-assignment of the 900/1800 MHz Spectrum will be open for bidding by all interested parties**, including the incumbent MNOs, mobile virtual network operators and new entrants to the local mobile telecommunications market. The four incumbent spectrum assignees may take part in the auction, irrespective of whether or not they have exercised their right of first refusal to acquire the RFR Spectrum they are offered.

Auction Format

86. Having considered the views and comments received in the two rounds of public consultation, **the CA has decided to adopt the Simultaneous Multiple Round Ascending auction format for the Re-assignment of the 900/1800 MHz Spectrum**. Under this format, five frequency slots in the 900 MHz band (i.e. B1, B2, B3, B4 and B5 as specified in Table 3 above) and a minimum of four frequency slots in the 1800 MHz band (i.e. A1, A2, A3 and A4 as specified in Table 2 above) will be auctioned simultaneously over multiple rounds with price adjustment on each frequency slot independently. If any of the incumbent spectrum assignees decide not to exercise the right of first refusal to acquire the RFR Spectrum it is offered (i.e. frequency slots R1, R2, R3 and R4 as specified in Table 1 above), the slots not taken up will be pooled together with the non-RFR Spectrum as the Auctioned Spectrum and put to auction. In each round, bidders may bid for one or more of the slots made available for auction.

Spectrum Cap

87. Under the hybrid approach for the Re-assignment of the 900/1800 MHz Spectrum, a minimum of 120 MHz and a maximum of 200 MHz of spectrum will be made available for auction, depending on whether the

incumbent spectrum assignees will exercise their right of first refusal to acquire the RFR Spectrum they are offered. With at least 120 MHz of Auctioned Spectrum, which accounts for more than one fifth of the total spectrum (i.e. 552 MHz) currently assigned for the provision of public mobile telecommunications services, it will be one of the largest pools of spectrum released via a single auction for competitive bidding by all interested parties¹⁸.

88. The CA notes that although the mobile telecommunications market in Hong Kong is intensively competitive, distribution of spectrum among MNOs is not even. As such, and given the large quantum of spectrum to be put out for auction (at least 120 MHz), unless the total amount of the 900/1800 MHz Spectrum that may be acquired by bidders is subject to a cap, auction could possibly result in an undue concentration of spectrum in the hands of certain MNOs which may have the effect of restricting competition¹⁹.

89. Accordingly, given the sizeable proportion of spectrum subject to the current re-assignment, having considered the current market situation and the feedback received in the two rounds of public consultation²⁰, and with the aim of avoiding unduly high concentration of spectrum holdings in the hands of any single spectrum assignee, **the CA has decided to impose a cap of 90 MHz on the amount of the 900/1800 MHz Spectrum, with a sub-cap of 20 MHz in the 900 MHz band, that may be acquired by a single bidder in the auction.** With such a level of spectrum cap, any incumbent MNO may acquire no less than the amount of the 900/1800 MHz Spectrum that it currently holds.

90. The spectrum cap will apply to all bidders alike, including the incumbent MNOs and new entrants, and cover both the RFR Spectrum and the

¹⁸ There have been two auctions conducted by the former TA that released more than 120 MHz of spectrum for competitive bidding each time. They were the auction for 138.4 MHz of spectrum in the 1.9 – 2.2 GHz band in 2001; and the auction for 195 MHz of spectrum in the 2.3 GHz and 2.5/2.6 GHz bands in 2009.

¹⁹ The potential effects on competition of high levels of spectrum concentration were previously considered in the competition analysis conducted by the CA in the context of granting its conditional approval to the merger between HKT and the former CSL Limited in 2014. Specifically, the CA was concerned that the acquisition of spectrum holdings in excess of the estimated long term data demand could reinforce the merged entity's market power and it required HKT to divest 29.6 MHz of spectrum in the 1.9 – 2.2 GHz band on 22 October 2016, as part of the CA's merger decision.

²⁰ Of the feedback relating to the spectrum cap received in the two rounds of public consultation, HKT which currently holds the largest amount of spectrum among the MNOs did not support the imposition of a spectrum cap, while the other three MNOs proposed a cap which is below the 90 MHz as proposed by the CA. For details about the CA's response to feedback on the spectrum cap, please refer to paragraphs 8.16 – 8.17 of **Annex 2**.

Auctioned Spectrum. Thus, if an incumbent spectrum assignee has exercised its right of first refusal to acquire the 20 MHz of RFR Spectrum it is offered, it will be eligible to bid for at most 70 MHz of the 900/1800 MHz Spectrum in auction. In the case of bidding by a joint venture of two incumbent spectrum assignees who have both exercised their right of first refusal to acquire the RFR Spectrum, a spectrum cap of 90 MHz will apply to the joint-venture bidder net of the combined 40 MHz of RFR Spectrum that they have acquired. Further details about the application of the spectrum cap to bidding, including the definition of connected bidders, will be specified in the relevant documents relating to the auction to be issued in due course.

91. Within the overall cap of 90 MHz, a sub-cap at 20 MHz will be imposed on the holding of spectrum in the 900 MHz band. This is in view of the superb radio propagation and penetration characteristics of the sub-1 GHz spectrum and hence the extra need to avoid concentration of the spectrum in one or two assignees. The imposition of a 20 MHz sub-cap should ensure that the number of spectrum assignees in the 900 MHz band will not be less than the present three and allows room to accommodate up to five MNOs. The spectrum sub-cap will likewise apply to all bidders, including the incumbent spectrum assignees and new entrants. It will be counted towards the overall cap of 90 MHz for the holding of the 900/1800 MHz Spectrum by individual MNOs. However, the spectrum sub-cap will not take into account the holdings of the other sub-1 GHz spectrum by some of the incumbent MNOs²¹, as the assignment term and conditions for that spectrum are independent of those of the 900/1800 MHz Spectrum to be re-assigned in 2020/21.

Licensing Arrangements

92. In line with the existing licensing regime, the incumbent MNOs which have exercised their right of first refusal to acquire the RFR Spectrum they are offered and/or successfully bid for the Auctioned Spectrum, and any new entrants which have successfully bid for the Auctioned Spectrum, will each be granted a new Unified Carrier Licence (“UCL”) to effect the assignments of the

²¹ HKT currently holds 2 x 7.5 MHz of spectrum in the 850 MHz band (825 – 832.5 MHz paired with 870 – 877.5 MHz) acquired through the auction conducted in 2007 for the provision of mobile services based on the Code Division Multiple Access 2000 (“CDMA2000”) standard, and the spectrum assignment will last until 2023. SmarTone and Hutchison respectively hold 2 x 5 MHz of spectrum in 850 MHz band (832.5 – 837.5 MHz paired with 877.5 – 882.5 MHz) and 900 MHz band (885 – 890 MHz paired with 930 – 935 MHz) acquired through the auction conducted in 2011 and the spectrum assignments will last until 2026.

900/1800 MHz Spectrum upon the commencement of the new assignment term. The UCL will authorise a spectrum assignee to provide such fixed or mobile services or a combination of both as it proposes. If the spectrum assignee is an existing UCL holder, it may request to merge its existing UCL with the new UCL issued for the Re-assignment of the 900/1800 MHz Spectrum.

Spectrum Assignment Periods

93. Having regard to the feedback received in the two rounds of public consultation, in order to facilitate a smooth handover of any spectrum among the existing and new assignees and to simplify administrative arrangements, **the CA has decided that the new assignment periods for all the spectrum in the 900 MHz band should be aligned to commence on 12 January 2021.** This will involve an administrative extension of the existing frequency assignment in the 900 MHz band for Hutchison by 53 calendar days from 20 November 2020, and for SmarTone by eight calendar days from 4 January 2021, subject to their payment of SUF for the use of the spectrum during the extended assignment periods. Schedule 2 of the Telecommunications (Carrier Licences) Regulation (Cap. 106V) requires UCLs to be issued for a term of 15 years from the day on which they are issued. The term of the frequency assignments will be for 15 years and be coterminous with that of the newly issued licences. It follows that the new 15-year term of assignments for the 2 x 25 MHz of spectrum in the 900 MHz band will be from 12 January 2021 to 11 January 2036.

94. On the SUF payable for using the spectrum in the 900 MHz band during the extended periods of assignment of 53 calendar days by Hutchison and eight calendar days by SmarTone, SCED proposed in the First and Second Consultation Papers that the SUF for the extended period of assignments shall be equal to the royalty payment for the year just before the expiry of the existing assignments proportionate to the number of days of the extended period. As no objection was raised to this proposal, and having considered the fact that the proposed extensions of existing assignments involve just a short period of time, SCED has decided to propose a regulation under section 32I(2) of the TO, to prescribe that the SUF for such extended periods should be based on the level of royalty payment for the year just before the expiry of the existing assignments.

95. **As regards the spectrum in the 1800 MHz band, the new 15-year term of assignments will be from 30 September 2021 to 29 September 2036.** This will apply to both the RFR Spectrum and the Auctioned Spectrum in the

1800 MHz band, as well as the 2 x 4.8 MHz of Country Park Frequencies to be re-assigned to the incumbent spectrum assignees for the provision of mobile coverage in the designated areas.

Special Condition on Phasing out of 2G and Other Generations of Mobile Services

96. In view of the need to maintain the satisfactory provision of 2G services which are supported solely by the 900/1800 MHz Spectrum until they are naturally phased out by market forces, and having regard to the feedback received in response to the Second Consultation Paper, **the CA has decided to impose the new Special Condition (“SC”) 10.4 below in the UCLs of all licensees authorised to provide public mobile telecommunications services –**

PROVISION OF SERVICE

10.4 The licensee shall seek the prior written consent of the Authority and make proper and appropriate arrangements for the affected customers to the satisfaction of the Authority before ceasing to provide a generation of mobile service.

The new SC 10.4 requires a licensee to seek the prior consent of the CA and to make satisfactory arrangements for the affected customers before the phasing out of 2G or any higher generations of mobile services.

97. The new licence condition will be incorporated into the UCLs of the incumbent MNOs upon their exercise of the right of first refusal to acquire the RFR Spectrum or upon their successful bidding for any frequency slot in the Auctioned Spectrum, whichever is earlier. In the event of a new entrant successfully bidding for any frequency slot in the Auctioned Spectrum, the new SC 10.4 will be incorporated into the new UCL to be issued to it upon assignment of the newly acquired spectrum in 2021. The new SC is constructed in such a way that it will be applicable not only to the phasing out of 2G services, but also 3G, 4G and the forthcoming generations of mobile services which are being or which are to be provided under the licence.

98. As regards the view of some respondents that the existing General Condition (“GC”) 5 of the UCL already requires a licensee to operate, maintain

and provide a good, efficient and continuous service at all times during the validity of a licence, the CA considers that the requirement and enforcement of GC 5 are *ex post* in nature, while the new SC imposes an *ex ante* requirement which enables the CA to ensure that satisfactory arrangements have been put in place for protection of consumer interests before MNOs may terminate a particular generation of mobile services entirely.

99. At present, there remain 1.5 million of 2G service subscribers, representing 8% of the total number of mobile subscribers. When the new SC is put into effect, an MNO may decide out of its own commercial consideration when to phase out its provision of 2G services. However, before it implements a total shut down of the 2G network and terminates the provision of all 2G services, it must put in place reasonable and appropriate arrangements for its subscribers to the satisfaction of the CA, such as migration of 2G subscribers to 3G or 4G services, or continued provision of 2G services using the networks of other MNOs by entering into relevant wholesale or other forms of commercial arrangements. Similar arrangements should be made for phasing out of other generations of mobile services in future.

Network and Service Rollout Obligations

100. Having regard to the feedback received in the two rounds of public consultation for the Re-assignment of the 900/1800 MHz Spectrum in the new term of assignment (commencing respectively on 12 January 2021 for spectrum in the 900 MHz band and 30 September 2021 for spectrum in the 1800 MHz band), **the CA has decided to impose on all spectrum assignees the following network and service rollout obligations: (a) to provide a minimum coverage of 90% of the population of Hong Kong in the case of mobile services; and (b) to provide a minimum coverage of 200 commercial and/or residential buildings and to establish and maintain a minimum of 50 hubs in the case of fixed services, within five years from the commencement date of the new assignment term and such minimum network coverage shall be maintained thereafter.** These obligations aim to ensure that the scarce spectrum resource will be deployed in a timely manner by spectrum assignee for the benefit of the general public.

Performance Bond for Rollout Obligations

101. To ensure compliance by the spectrum assignees of the rollout obligations, **the CA has decided to require the following groups of assignees to lodge a performance bond: (a) successful bidders who have newly acquired spectrum in the 900 MHz and 1800 MHz bands; and (b) incumbent spectrum assignees who are assigned frequency slots in the Auctioned Spectrum where the majority of the spectrum in any of these frequency slots is not currently held by them.** The amount of performance bond will be specified by the CA in the information memorandum to be issued for the auction of the Auctioned Spectrum.

102. No performance bond will be imposed on incumbent spectrum assignees in regard to the assigned frequency slots in the RFR Spectrum. In regard to the Auctioned Spectrum, if a majority of spectrum in any of the frequency slots is currently held by the incumbent spectrum assignees, a performance bond is also not required. Instead, the incumbent assignees will be required to provide network coverage figures demonstrating that their networks operating with such spectrum they are assigned in the 900 MHz and 1800 MHz bands fulfil the 90% minimum population coverage requirement.

IMPLEMENTATION OF THE ARRANGEMENTS FOR SPECTRUM RE-ASSIGNMENT

103. In tandem with the publication of this Statement, the CA has issued letters of notice to the four MNOs to notify them of its decision to adopt the hybrid administratively-assigned cum market-based approach for the Re-assignment of the 900/1800 MHz Spectrum, together with the frequency ranges of the spectrum in the 1800 MHz band intended to be re-assigned to each of them through the offer of a right of first refusal.

104. The Government will make the necessary arrangements for amendment of the relevant subsidiary legislation to enable the Re-assignment of the 900/1800 MHz Spectrum to proceed as per the decisions of the CA and SCED. Subject to the completion of the legislative process, the CA intends to offer to the incumbent spectrum assignees in the second half of 2018 the right of first refusal for the re-assignment of the RFR Spectrum. Subject to their decisions on

acceptance or otherwise of the offer, the total amount of the Auctioned Spectrum will be confirmed. The CA will then prepare for the auction which is targeted to be conducted around the end of 2018.

Communications Authority
Secretary for Commerce and Economic Development
19 December 2017

Table 1: Distribution of Spectrum among MNOs

	Spectrum due for re-assignment in 2020/21					Share in MNO's total
	Overall	Share	900	1800	Total	
	total	in total	MHz	MHz	(MHz)	
	(MHz)		(MHz)	(MHz)	(MHz)	
CMHK	116.0	21%		26.4	26.4	23%
HKT	194.0	35%	16.6	72.8	89.4	46%
Hutchison	129.4	23%	16.6	23.2	39.8	31%
SmarTone	112.6	20%	16.6	26.4	43.0	38%
Total	552.0	100%	49.8	148.8	198.6	36%

Table 2: Application of Radio Spectrum in the Provision of Public Mobile Telecommunications Services

Frequency band	<u>Type of mobile services*</u>				Total
	2G	3G	4G	CDMA 2000	
	(MHz)	(MHz)	(MHz)	(MHz)	(MHz)
850/900 MHz		20.0		15.0	35.0
900 MHz	15.2		34.6		49.8
1800 MHz	28.8		120.0		148.8
1.9 – 2.2 GHz		98.6	19.8		118.4
2.3 GHz			60.0		60.0
2.5/2.6 GHz			140.0		140.0
Total	44.0	118.6	374.4	15.0	552.0

Note: (*) The type of mobile services supported by each individual frequency bands refers to the highest order of use that the corresponding frequency band is being deployed for. In the case where the reform of a certain frequency slot has not yet been completed, it may still be used for the provision of the type of mobile services before reform at certain locations, and for the provision of the reformed services at the other locations.

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**Summary of Submissions to the Second Consultation Paper
and the Responses of
the Communications Authority and
the Secretary for Commerce and Economic Development**

Section 1: Introduction

1.1 The Communications Authority (“CA”) and the Secretary for Commerce and Economic Development (“SCED”) jointly conducted two rounds of public consultation to seek the views and comments of the telecommunications industry and other affected persons on the arrangements for the re-assignment of 49.8 MHz of spectrum in the 900 MHz band and 148.8 MHz of spectrum in the 1800 MHz band upon expiry of the existing assignments and the related spectrum utilisation fee (“SUF”). The spectrum is currently being deployed for the provision of the second, third and fourth generation (“2G”, “3G” and “4G”) mobile services. Together with vacant spectrum of 0.2 MHz in the 900 MHz band and 1.2 MHz in the 1800 MHz band, a total of 200 MHz of spectrum in the 900 MHz and 1800 MHz bands (“900/1800 MHz Spectrum”) is due for assignment/re-assignment (hereafter collectively referred to as “Re-assignment of the 900/1800 MHz Spectrum”).

1.2 The first consultation paper, which was published on 3 February 2016 (“First Consultation Paper”), identified the objectives for spectrum re-assignment, viz. (a) ensuring customer service continuity; (b) efficient spectrum utilisation; (c) promotion of effective competition; and (d) encouragement of investment and promotion of innovative services¹.

1.3 The following three spectrum re-assignment options were proposed in the First Consultation Paper for views and comments –

- Option 1 – a full-fledged administratively-assigned approach that offers a right of first refusal to the incumbent spectrum assignees to acquire their current holding of the 900/1800 MHz Spectrum;

¹ These are the same multiple objectives that the CA adopted for the re-assignment of spectrum in the 1.9 – 2.2 GHz band upon expiry of the assignments in October 2016.

- Option 2 – a full-fledged market-based approach that re-assigns all the 900/1800 MHz Spectrum by way of auction; and
- Option 3 – a hybrid administratively-assigned cum market-based approach that re-assigns part of the 900/1800 MHz Spectrum to the incumbent spectrum assignees through the offer of a right of first refusal (“RFR Spectrum”) with the remaining 900/1800 MHz Spectrum (including any spectrum that may become available due to the decision of any incumbent spectrum assignee not to exercise its right of first refusal to take up the RFR Spectrum) to be re-assigned by way of auction (collectively “Auctioned Spectrum”).

1.4 Having carefully considered the views and comments received in the first round of public consultation, and the findings of the independent consultancy study (“Study”) conducted by an external consultant (“Consultant”) commissioned by the CA through the Office of the Communications Authority (“OFCA”), the CA and SCED jointly issued the second consultation paper on 14 February 2017 (“Second Consultation Paper”)².

1.5 A revised hybrid administratively-assigned cum market-based approach was proposed for further views and comments in the Second Consultation Paper, under which 2 x 10 MHz of spectrum in the 1800 MHz band would be offered for re-assignment to each of the four incumbent spectrum assignees through the offer of a right of first refusal, giving a total of 2 x 40 MHz of RFR Spectrum (i.e. 40% of the 900/1800 MHz Spectrum). The remaining 2 x 60 MHz or 60% of the 900/1800 MHz Spectrum, together with any spectrum that may become available due to the decision of any incumbent spectrum assignee to not exercise its right of refusal to take up the RFR Spectrum, will be put to auction. SCED also proposed in the Second Consultation Paper, in respect of the revised hybrid option, detailed methods of setting the SUF of the RFR Spectrum and the Auctioned Spectrum, and the methodology for setting the

² The report of the Study entitled “*Technical Study in relation to the Re-assignment of Spectrum in the 900 MHz and 1800 MHz Bands upon Expiry of the Existing Assignments*” was published on 14 February 2017 together with the Second Consultation Paper, on OFCA’s website at: http://www.ofca.gov.hk/filemanager/ofca/common/reports/consultancy/cr_201702_01_en.pdf.

auction reserve price for the Auctioned Spectrum as well as the minimum price and cap for the SUF of the RFR Spectrum.

1.6 At the close of the second round of public consultation on 24 May 2017 (extended from the original deadline of 24 April 2017), submissions were received from 22 respondents below listed under different categories and in alphabetical order –

Mobile Network Operators (“MNOs”)

- China Mobile Hong Kong Company Limited (“CMHK”)
- Hong Kong Telecommunications (HKT) Limited (“HKT”)
- Hutchison Telephone Company Limited (“Hutchison”)
- SmarTone Mobile Communications Limited (“SmarTone”)

Other Commercial Firms

- Airbus Helicopters China HK Limited (“Airbus”)
- Comba Telecom Limited (“Comba”)
- Huawei International Company Limited (“Huawei”)
- HUBER+SUHNER (Hong Kong) Limited (“H + S”)
- M. Magtague Company Limited (“Magtague”)
- MaBelle Jewellery Company Limited (“MaBelle”)
- Nittel Communications Hong Kong Limited (“Nittel”)
- Nokia Solutions and Networks HK Limited (“Nokia”)
- NTT DOCOMO INC. (“NTT”)
- Shing Kee Lan Company Limited (“SKL”)
- Simpson Marine Limited (“Simpson Marine”)
- ZTE (H.K.) Limited (“ZTE”)

Organisation

- GSM Association (“GSMA”)

Consultant

- Competition Economists Group (“CEG”)

Individuals

- Edmond Yip
- Lai Kin Wah
- Simon Lo
- 陳耀榮

1.7 Having carefully considered the submissions received, including the clarifications provided by the four MNOs upon the requests of OFCA, and having evaluated the pros and cons of the three spectrum re-assignment options against the multiple objectives in spectrum re-assignment, the CA and SCED set out in this Annex their respective responses to the respondents' comments on the proposed arrangements for the Re-assignment of the 900/1800 MHz Spectrum and the related SUF. For the avoidance of doubt, the CA and SCED have taken into account and given thorough consideration to all the submissions which are relevant to the Re-assignment of the 900/1800 MHz Spectrum though not all of the issues raised are specifically mentioned or addressed herein.

1.8 Nothing in this document represents or constitutes a decision made by the CA or SCED. The views and comments set out in this document are without prejudice to the exercise of the powers by the CA or SCED under the Telecommunications Ordinance (Cap. 106) ("TO") or any subsidiary legislation.

Section 2: Ensuring Customer Service Continuity

2.1 In the Second Consultation Paper, the CA proposed for further consultation the adoption of the revised hybrid approach under which 2 x 10 MHz of spectrum in the 1800 MHz band would be offered for re-assignment as the RFR Spectrum to each of the four incumbent spectrum assignees to address the concern about the continuity of 4G services in the 43 Mass Transit Railway (“MTR”) stations where such services will continue to be supported primarily by spectrum in the 1800 MHz band by the time of spectrum re-assignment in 2021 (“Remaining MTR Stations”)³, and to safeguard the continuity of 2G services in the territory which are supported solely by the 900/1800 MHz Spectrum. Under the revised hybrid approach, the remaining spectrum in the 1800 MHz band and all the spectrum in the 900 MHz band will be assigned by way of auction. The CA has taken into consideration the opinion of the Consultant in the report of the Study in making this proposal.

Views and Comments of the Respondents

2.2 Hutchison reiterates its position in its submission to the First Consultation Paper that the full-fledged administratively-assigned approach under Option 1 would ensure the continuity and quality of 2G, 3G and 4G services, and is the only rational and reasonable choice to be adopted for the Re-assignment of the 900/1800 MHz Spectrum. It also considers that the provision of uninterrupted mobile services is crucial for public safety and security especially along the MTR lines and that this is best supported by spectrum in the 900 MHz band. HKT refers to a statement made by the CA in the context of the re-assignment of the spectrum in the 1.9 – 2.2 GHz band (“3G Spectrum”) that Option 1 would enable a more or less seamless transition and hence service continuity. CEG also supports Option 1 and argues for HKT that a less than full re-assignment of the 900/1800 MHz Spectrum to HKT would result in a service degradation on its network. Among the other respondents, NTT, Nokia and ZTE all emphasize the importance of ensuring customer service continuity, with NTT supporting Option 1 and Nokia and ZTE supporting the hybrid approach of Option 3. Huawei and three individual respondents express concern about the continuity and quality of customer services in general.

³ For details about the arrangements for the provision of mobile services in all the 94 MTR stations, including the nine MTR stations opened in 2016 and the 18 MTR stations where the integrated radio systems upgrade works are expected to be completed by 2019, please see paragraphs 39 – 41 of the Second Consultation Paper.

2.3 Both Hutchison and SmarTone point out that upgrading of the integrated radio systems (“IRS”) in the Remaining MTR Stations to deploy the 2.3 GHz and 2.5/2.6 GHz bands and to install the frequency agile equipment is unlikely to be completed by 2020/21 when the 900/1800 MHz Spectrum is re-assigned. Hutchison advocates including the 900 MHz band in the RFR Spectrum. On the other hand, SmarTone considers that the revised proposal of the CA to increase the amount of the RFR Spectrum to 2 x 10 MHz can effectively address the concern about continuity of 4G services at the MTR premises, thereby meeting the objective of ensuring customer service continuity. CMHK also supports the adoption of the hybrid approach for ensuring customer service continuity.

2.4 CEG, HKT and Hutchison also comment on the report of the Study published together with the Second Consultation Paper. Notwithstanding the fact that the Consultant has incorporated the input of MNOs in developing its assessment model for gauging network performance under different spectrum re-assignment scenarios, CEG and HKT consider that the traffic forecast adopted by the Consultant is way below that of a renowned industry body⁴, while Hutchison considers that the modelling results have not paid regard to user experience when network loading approaches the maximum. In particular, Hutchison doubts the adequacy of 2 x 10 MHz of RFR Spectrum in addressing the issue of 4G service continuity at the MTR premises, and points out the possibility of new entrants acquiring more than 2 x 20 MHz of the Auctioned Spectrum, which is the maximum assumed by the Consultant. All the three respondents regard the mitigation measures recommended by the Consultant as impractical, due to the technical constraints of implementation in a dense urban environment. CEG is also concerned about the cost of implementing the mitigation measures. CEG and HKT also consider that the redaction of the commercially sensitive information in the Study report makes it difficult for them to comment on the report.

Responses of the CA

2.5 The CA notes and understands the emphasis placed by most of the respondents on the need to ensure customer service continuity. While the adoption of Option 1 would ensure the continuity of different types of mobile

⁴ References were made by the respondents to the traffic forecasts by Cisco, a vendor of telecommunications equipment.

services, both territory-wide and in indoor areas such as the MTR premises, it is not the only option that can fulfil this objective.

2.6 HKT's allegation that the CA accepted in the context of the re-assignment of the 3G Spectrum in October 2016 that administrative re-assignment (on a similar basis as Option 1) best achieved service continuity misinterprets the position of the CA in that exercise. In paragraph 28 of the Statement of the CA and SCED of 15 November 2013⁵, the CA explained that it was satisfied that, having taken into account the findings of the consultancy study then commissioned by OFCA, service continuity can also be reasonably assured under the hybrid approach adopted in that previous exercise (which is very similar to Option 3 in the present exercise). The hybrid approach in both the last exercise of re-assignment of the 3G Spectrum and the present exercise can better meet the other spectrum re-assignment objectives than Option 1.

2.7 When considering customer service continuity, an important factor is that 2G services are provided with the use of the 900/1800 MHz Spectrum only. In contrast, spectrum used by MNOs for the provision of 3G services is mainly in the 1.9 – 2.2 GHz band. Besides, the provision of 4G services is supported not only by the 900/1800 MHz Spectrum, but also by spectrum in the 1.9 – 2.2 GHz, 2.3 GHz and 2.5/2.6 GHz bands. These other frequency bands taken together account for almost 60% of the spectrum deployed for the provision of 4G services, and they will not be affected at all by the present spectrum re-assignment exercise. According to the findings of the Consultant, the continuity of 4G services is only a concern in the Remaining MTR Stations which are expected to continue to rely primarily on the 120 MHz of spectrum in the 1800 MHz band by the time of the spectrum re-assignment in 2021⁶. To address the problem, the CA has decided to adopt the hybrid approach for spectrum re-assignment and to re-assign a total of 80 MHz, or 67% of the spectrum currently deployed for the provision of 4G services in the Remaining MTR Stations, to the incumbent spectrum assignees through the offer of a right

⁵ The decision of the CA and SCED on the re-assignment of the 3G Spectrum was made in November 2013 via the Statement of the CA and SCED on Arrangements for the Frequency Spectrum in the 1.9 – 2.2 GHz Band upon Expiry of the Existing Frequency Assignments for the Provision of 3G Mobile Services and the Spectrum Utilisation Fee, which is available at: http://www.coms-auth.hk/filemanager/statement/en/upload/237/ca_statements20131115_en.pdf.

⁶ It is noted that progress has been made by some MNOs to deploy part of their assigned spectrum in the 1.9 – 2.2 GHz band, originally the core band for 3G services, for the provision of 4G services at the MTR premises, but the prospects and pace of further refarming are uncertain, given there are still 8.5 million of 3G service subscribers or 47% of the total.

of first refusal, such that the provision of 4G services will be maintained throughout all the MTR premises.

2.8 As pointed out by the CA in the First Consultation Paper, 2G service continuity could be a potential concern as 2G services are provided with the use of the 900/1800 MHz Spectrum only. Nevertheless, based on the carrier bandwidth of 2 x 0.2 MHz supported by the Global System for Mobile Communications or GSM technology used for 2G services in Hong Kong and a standard re-use factor of 12 for network planning, it is estimated that only a small portion, namely 2 x 2.4 MHz of the 900/1800 MHz Spectrum, would be required to support the territory-wide 2G voice services. The decision of the CA to offer for re-assignment to each of the four incumbent spectrum assignees 2 x 10 MHz of spectrum in the 1800 MHz band as the RFR Spectrum under the hybrid approach, apart from safeguarding the continuity of 4G services in the Remaining MTR Stations, will also provide the capacity required for serving the existing 1.5 million of 2G service subscribers in Hong Kong as well as inbound roamers.

2.9 As regards the amount of RFR Spectrum needed to ensure service continuity, while SmarTone supports the CA's proposal of making available 2 x 10 MHz in the 1800 MHz band for each incumbent spectrum assignee for that purpose, there are comments that more spectrum should be offered, including spectrum in the 900 MHz band, for re-assignment to the incumbent spectrum assignees through the offer of a right first refusal. The CA has already explained in the above that the 2 x 10 MHz of spectrum in the 1800 MHz band to be re-assigned as RFR Spectrum would serve to safeguard the continuity of 4G services at the MTR premises and 2G services on a territory-wide basis. As for the provision of 4G services outside MTR premises and 3G services on a territory-wide basis, since they are supported also by other frequency bands, the provision of these services is not affected by the present spectrum re-assignment exercise and hence there is no service continuity issue.

2.10 It should also be pointed out that ensuring service continuity is not equivalent to guaranteeing the existing level of service quality for individual MNOs. It is incumbent upon the MNOs themselves to take the necessary actions such as bidding for the necessary amount of 900/1800 MHz Spectrum in the auction, after making their decisions on whether to exercise their right of first refusal to acquire the RFR Spectrum, and/or to invest further in their networks

for the provision of quality mobile services to their own customers.

2.11 Hutchison comments that the 900 MHz band should be included in the RFR Spectrum to facilitate the provision of uninterrupted mobile services for public safety and security reasons especially along the MTR lines. Special Condition (“SC”) 12 relating to emergency call service in the Unified Carrier Licence (“UCL”) requires MNOs to provide a public emergency call service by means of which any member of the public may, using compatible apparatus connected to the network of the MNOs at any time and without incurring any charge, communicate as quickly as practicable with the Hong Kong Police Emergency Centre (or other entities as directed by the CA) to report an emergency. This means that mobile phone users will be able to connect to emergency services through the network of any MNO using any frequency band. Networks on the 900 MHz band are but one of the many networks inside the MTR capable of providing access to emergency services.

2.12 The respondents’ views and comments on the report of the Study, including those on the assumptions adopted in the assessment model, mitigation measures recommended in case of service degradation, recommendations on the RFR Spectrum, and redaction of commercially sensitive information in the Study report, are addressed in the separate responses of the Consultant which are published together with this Statement⁷.

⁷ Responses of the Consultant to the view and comments on the study report are provided in the paper “*Response to Views and Comments on the Technical Study Conducted by Plum Consulting in the Submissions to the Second Consultation on the Arrangements for the Frequency Spectrum in the 900 MHz and 1800 MHz Bands upon Expiry of the Existing Assignments for Public Mobile Telecommunications Services and the Spectrum Utilisation Fee*”, which is published today together with this Statement and is available at:
http://www.ofca.gov.hk/filemanager/ofca/common/reports/consultancy/cr_201712_19_en.pdf.

Section 3: Efficient Spectrum Utilisation

3.1 The view of the CA, as set out in the Second Consultation Paper, is that the hybrid approach under Option 3 would be more likely to encourage efficient utilisation of spectrum than the full-fledged administratively-assigned approach under Option 1, and that Option 3 is likely to be very nearly as effective as the full-fledged market-based approach under Option 2 in that regard. With a majority of the spectrum to be re-assigned by way of auction, the hybrid approach potentially enhances the efficiency in spectrum utilisation by providing opportunities for (a) the 900/1800 MHz Spectrum to be assigned through competitive bidding to the MNOs which value it the most and hence will put it to the most efficient use; (b) the incumbent spectrum assignees to review and optimise their spectrum holdings; and (c) entry of additional players into Hong Kong's mobile telecommunications market. The hybrid approach under Option 3 is also capable of facilitating technically more efficient use of spectrum through consolidation of the currently fragmented band plans for the 900/1800 MHz Spectrum.

Views and Comments of the Respondents

3.2 HKT and Hutchison opine that the 900/1800 MHz Spectrum is already being used efficiently by the MNOs due to the ever rising demand for high speed mobile data services and keen competition in the market. HKT, Hutchison and CEG do not agree that re-assignment by auction would contribute to more efficient spectrum utilisation. They argue that new entrants do not necessarily guarantee more efficient spectrum utilisation. Rather, additional market players are expected to lead to further spectrum fragmentation, and new players may not put the spectrum to immediate use. They all quote the acquisition of the spectrum in the 2.3 GHz band by the 21 ViaNet Group Limited ("21 ViaNet") in 2012 as an example of a new entrant not utilising the newly acquired spectrum efficiently. CEG is concerned that the uncertainty in spectrum access would dampen investments of MNOs to make more efficient use of the spectrum. CEG and HKT also consider spectrum trading to be a more effective means to attain better efficiency in spectrum utilisation than re-assignment by auction. Regarding the inefficiencies embedded in the currently fragmented band plans for the 900/1800 MHz Spectrum, CEG and HKT consider that defragmentation can also be implemented through administrative re-assignment of the spectrum to the incumbent MNOs, with the result that each of them will

hold the same amount of spectrum as before re-assignment.

3.3 SmarTone supports the hybrid approach proposed for spectrum re-assignment on grounds that it offers the opportunity for MNOs to optimise their respective holdings of the 900/1800 MHz Spectrum through auction. Further, existing MNOs or new entrants may bid for spectrum to achieve a larger frequency slot of 2 x 20 MHz in the 1800 MHz band, which is the maximum carrier bandwidth currently supported by the 4G long term evolution (“LTE”) technology. Both SmarTone and ZTE emphasize the importance of allowing carriers to secure larger bandwidths due to the limit of a maximum of five component carriers under LTE-Advanced (“LTE-A”) carrier aggregation technology and the difficulty for most of the 4G terminals in aggregating multiple fragmented carriers.

Responses of the CA

3.4 In relation to current use of spectrum by MNOs, the CA agrees that keen competition in the mobile telecommunications market would be expected to exert pressure on MNOs to utilise the spectrum efficiently. However, the extent to which the existing assignments of the 900/1800 MHz Spectrum, which took effect more than a decade ago, would remain optimal in the market environment today is unclear and questionable.

3.5 To elaborate, the existing assignments of the majority of the 900/1800 MHz Spectrum took effect in 2005/06, through the offer of the right of first refusal to the then incumbent spectrum assignees. Since then the market has evolved and developed substantially, both in terms of the portfolio of the services offered (e.g. with mobile data services becoming more important than voice services) and the market environment (e.g. the number and market share of the market participants). Hence, it is questionable whether the existing spectrum assignments could continue to ensure that the available spectrum will be placed in the hands of those who will utilise it the most efficiently. The hybrid option adopted by the CA, for the Re-assignment of the 900/1800 MHz Spectrum, in embodying an element of auction, will enable existing MNOs, having regard to the projected number and service demand of their customers, to optimise their holdings of spectrum in the 900 MHz and 1800 MHz bands. For example, some MNOs may find it more economical to acquire more spectrum while others may choose to invest in additional network infrastructure instead, taking into account

the levels of the SUF as determined by the successive rounds of bidding in auction and their own commercial considerations. Such an approach will also offer an opportunity for new entrants to acquire the spectrum they need to enter and compete effectively in the mobile telecommunications market. The CA's view is that auction of the 900/1800 MHz Spectrum serves to assign the scarce public resource to the MNOs which value it the most and can potentially put it to the most efficient use.

3.6 The other problem associated with the legacy spectrum assignments is that frequency blocks are in the multiples of 2×0.2 MHz, which is the bandwidth of a carrier for 2G voice services. As a result, the fragmented spectrum holdings by individual MNOs, ranging from 2×0.8 MHz to 2×3.2 MHz in the 900 MHz and 1800 MHz bands, would inhibit the refarming of spectrum for the provision of 3G services (requiring a typical carrier bandwidth of 5 MHz) and 4G services (requiring carrier bandwidths of 1.4, 3, 5, 10, 15 or 20 MHz), rendering it very difficult, if not impossible, to achieve more efficient use of the same amount of spectrum during the new assignment term. Presently, as much as 44 MHz of the 900/1800 MHz Spectrum is deployed by the MNOs for the provision of 2G services, but the bandwidth actually required for the carriage of voice traffic could be much smaller. There are thus strong indications that the 900/1800 MHz Spectrum is not currently being utilised in the most efficient manner given the mobile technologies available today and those as envisaged for the future. The hybrid approach adopted by the CA provides an opportunity for re-organising and consolidating the currently fragmented frequency slots in the 900 MHz and 1800 MHz bands for re-assignment and paves the way for more efficient use of the spectrum post 2021 in the next 15 years of the new assignment term.

3.7 CEG and HKT suggest that defragmentation of the band plans for the 900/1800 MHz Spectrum can be implemented through administrative re-assignment. Option 1 involves re-assignment of each of the MNOs' existing spectrum holdings on the basis of the offer of a right of first refusal. The CA has made it clear in this Statement and the Annex that its assessment is that a perpetual assignment of spectrum as in Option 1 is not the option that can best meet the multiple objectives of spectrum re-assignment and the reasoning would not be repeated here. With the above reservation clearly restated here, the CA sets out, for the sake of completeness, its assessment of the proposal of CEG and HKT. The upshot is, after the re-organisation of the band plans, it would not be

feasible for the incumbent MNOs to be re-assigned amounts of the 900/1800 MHz Spectrum which are exactly the same as their current holdings with the re-organised band plans comprising frequency slots of 2 x 5 MHz and/or 2 x 10 MHz. Any attempt of the CA to administratively assign the re-organised frequency slots to the incumbent MNOs under Option 1 would invariably lead to spectrum holdings among MNOs which are different from those they currently hold, and it is likely that they would not be considered by all to be fair and reasonable. Also, any re-assignment, involving variation of frequency ranges, to the incumbent assignees might necessarily involve reconfiguration of their networks and possible service disruptions, not to mention the fact that the costs of reconfiguration would not necessarily fall evenly among all MNOs.

3.8 In relation to the concern that new players may not be in a position to put spectrum to immediate use, the CA is not unduly concerned about the possibility that spectrum utilisation may come to a halt temporarily during the transitional period while the new entrants construct the necessary network infrastructure. Under the hybrid approach, an auction is expected to be conducted by around the end of 2018. This will mean that any new entrant successfully acquiring spectrum would be able to start building its network in about two years before the re-assignment of the spectrum in the 900 MHz band (in January 2021) and in around two and a half years before re-assignment of the spectrum in the 1800 MHz band (in September 2021). Deployment of spectrum by the new spectrum assignees within a specified timeframe is ensured by the relevant licence obligation on rollout of network under the UCL to be issued to them.

3.9 Any concern that Option 3 may lead to less efficient spectrum use as a result of new entrants further fragmenting spectrum holdings would be addressed by the CA's decision to re-organise the band plan for the 900 MHz band into five 2 x 5 MHz slots and that for the 1800 MHz band into seven 2 x 10 MHz slots together with a 2 x 5 MHz slot.

3.10 The claim by some respondents that 21 ViaNet has not effectively utilised the 30 MHz of spectrum in the 2.3 GHz band it acquired through the auction held in 2012 is not substantiated by facts. All successful bidders in the auction of the 2.3 GHz band are permitted to use the assigned spectrum to provide fixed, mobile or a combination of these services. 21 ViaNet has started to deploy the spectrum for the provision of wireless fixed broadband services to

inhabitants in the rural and remote areas since early 2017, where there are fewer service choices than in the urban areas.

3.11 CEG and HKT suggest that spectrum trading would be a more effective means of attaining greater efficiency in spectrum utilisation than re-assignment by auction. The CA notes that spectrum trading is distinct from spectrum re-assignment and one needs not necessarily be a substitute for the other. In any event, it has to be pointed out that as a matter of policy, spectrum trading is not permitted in Hong Kong. It is, therefore, not a relevant consideration for the CA's assessment of the options for the Re-assignment of the 900/1800MHz Spectrum.

3.12 The views of SmarTone that Option 3 will contribute to higher spectral efficiency by enabling the incumbent MNOs to attain a larger bandwidth of 2 x 20 MHz in the 1800 MHz band are noted. This is in fact one of the considerations of the CA in designing the re-organised band plans for the Re-assignment of the 900/1800 MHz Spectrum, so as to facilitate MNOs in attaining larger transmission capacity and higher spectral efficiency through using larger bandwidth carriers and aggregating carriers in the same or different frequency bands.

Section 4: Promotion of Effective Competition

4.1 In the Second Consultation Paper, the CA expressed its preliminary view that Option 1 would likely be the least effective option in stimulating competition in the local mobile telecommunications market following the proposed re-assignment. In contrast, the full-fledged market-based approach under Option 2 and the hybrid approach under Option 3, involving respectively all the 200 MHz and a sizable amount of the 900/1800 MHz Spectrum to be re-assigned by way of auction, would not only provide an opportunity for the incumbent MNOs to review their existing spectrum holdings and bid for the optimal amount of spectrum required to satisfy their business needs, but would also provide an opportunity for new players to enter the local mobile telecommunications market. The CA provisionally considered Option 3 to be more likely than the full-fledged administratively-assigned approach under Option 1, and not materially less likely than the full-fledged market-based approach under Option 2, to promote competition.

Views and Comments of the Respondents

4.2 A number of respondents, including CEG, Comba, HKT, Hutchison and ZTE, point to the keenly competitive mobile telecommunications market in Hong Kong, and express doubts about the likelihood of a spectrum auction bringing in new entrants and also the need for, and the possibility of, additional players further strengthening market competition. Hong Kong is regarded by some respondents as a mature market that should not be attractive to new entrants. While Hutchison refers to the recent international experience of consolidation between MNOs, ZTE raises concern about over competition harming all players and causing risks to the continuity and quality of services. CEG further comments that re-assigning spectrum through auction would create a risk to competition due to delays in service launch amid uncertainty in future spectrum access, and changes in spectrum holdings and the price paid for acquisition of spectrum in auction would undermine the existing competitive dynamics in the market. Hutchison holds a similar view that loss of spectrum by one or more MNOs would dampen their ability to compete effectively.

4.3 In commenting on the contribution of new entrants in promoting effective competition, both HKT and Hutchison refer to the acquisition of 30 MHz of spectrum in the 2.3 GHz band by 21 ViaNet in the auction held in

2012 as an example of new entrants failing to stimulate competition in the mobile telecommunications market, as the spectrum has been deployed for the provision of wireless fixed broadband services in the remote villages. HKT also argues that entry by mobile virtual network operators (“MVNOs”) could stimulate competition. It refers to case of the Hong Kong Broadband Network Limited (“HKBN”) entering the market as a MVNO as an example of successful entry of new players without the need for any change in spectrum holdings of the incumbent MNOs. Further, both HKT and CEG regard spectrum trading as an effective alternative means to facilitate entry of new players and enhance the competitive dynamics in the market.

Responses of the CA

4.4 The CA acknowledges that the mobile telecommunications market in Hong Kong is one of the most competitive in the world. However, in assessing whether an option for re-assignment meets the objective of promoting effective competition, the CA does not have to form a view on the extent to which new entry in the mobile telecommunications markets in Hong Kong is needed or is the likely outcome. The CA’s view is that the optimal number of competitors in the market should be determined by market forces. Under the revised hybrid approach, a minimum of 120 MHz of spectrum will be available for bidding by interested parties, including the incumbent MNOs and any potential new entrants. This will provide an opportunity for any interested new players to enter the market, and provide additional choice of service providers which should be to the benefit of consumers. At the very least, entry or the threat of entry would be expected to provide a competitive constraint on the incumbent MNOs, whereas Option 1 (administrative re-assignment) would foreclose any chance of entry and remove such competitive constraints on the incumbent MNOs.

4.5 Potential entry of new players aside, as noted in paragraph 3.5 above, a market-based approach to spectrum re-assignment (under Option 2 or Option 3) offers incumbent MNOs the opportunity to optimise their spectrum holdings through bidding in the auction. This has the potential to enhance the efficiency in spectrum utilisation and to promote effective competition in the market. Technically, additional spectrum can make possible aggregation of larger carrier bandwidths by the incumbent MNOs to support higher speed of transmission, enhance the quality of services provided and enable the developments of more advanced technologies and innovative services, thereby strengthening their competitiveness in the market.

4.6 The CA does not generally share the concern expressed by CEG and Hutchison about the competitive dynamics in the market being dampened as a result of changes in spectrum holdings. As long as the bidding process is fair and open, changes in spectrum holdings are market outcomes which should promote economic efficiency and effective competition in the long term. That said, the CA accepts that competition concerns could arise if the auction results in concentration of a very substantial share of spectrum in the hand of a single MNO. In this regard, an overall cap on the total amount of the 900/1800 MHz Spectrum and a sub-cap on the spectrum in the 900MHz band that a bidder can acquire in the auction should be able to address at least some of these concerns.

4.7 In relation to any potential risk to competition due to a delay in investment and/or introduction of new technologies while future assignment of the 900/1800 MHz Spectrum remains undecided, the Radio Spectrum Policy Framework (“Spectrum Policy Framework”) promulgated by the Government in April 2007 makes it clear that there is no legitimate expectation of any right of renewal or right of first refusal of spectrum assignments upon expiry. Hence, the incumbent MNOs should have been aware of the possibilities of their spectrum holdings being made subject to changes upon expiry of assignments. The CA has not seen any evidence substantiating the claim that competition among MNOs has become muted – either in relation to attracting customers or launch of new services – as the end of the current assignments draw near. The important point is that the incumbent MNOs will be given a sufficiently advance notice about any possible change in spectrum assignments, so that they can adjust their business plans accordingly. It is for this reason that the CA has committed to announcing its decision on spectrum re-assignment three years in advance of the expiry of the assignments of spectrum in the 900 MHz band, and three years and eight months in advance for spectrum in the 1800 MHz band.

4.8 As regards the risk of over competition as raised by ZTE, it should be noted that one of the policy objectives of the CA for spectrum re-assignment is to promote competition, rather than to protect MNOs from too much competition. In a market with free entries and exits, concerns about over competition is unfounded. If there are too many players in the market, it is likely that consolidation by merger⁸ or exit of players would come about. Ultimately, the

⁸ Mergers involving carrier licence holders within the meaning of the TO are governed by the Merger Rule provided under Schedule 7 of the Competition Ordinance (Cap. 619) that an undertaking must not, directly or indirectly, carry out a merger that has, or is likely to have, the effect of substantially lessening competition in Hong Kong.

optimal number of players and the success or not of individual players are best left to the market to decide.

4.9 In relation to HKT's and Hutchison's reference to the entry of 21 ViaNet not stimulating competition in the mobile telecommunications market, the CA does not subscribe to this view. In making available the relevant spectrum in the 2.3 GHz band for auction, the CA made it clear that the spectrum could be used for either fixed, mobile or a combination of these services. 21 ViaNet elected to provide internal fixed telecommunications services as soon as it had successfully bid for the spectrum, and was so authorised by the CA in the UCL granted to it in 2012. It is now deploying the 30 MHz of spectrum in the 2.3 GHz band that it acquired in the auction held in 2012 to provide wireless fixed broadband services to villages in the rural and remote areas, and has effectively enhanced competition of fixed services in the underserved areas in Hong Kong. The case of 21 ViaNet demonstrates the merit of spectrum auction in attracting new entrants to the local telecommunications market to provide new types of services to cater for unmet demands in different market segments and through it to stimulate competition among operators.

4.10 As to the suggestion of HKT that new players may enter the market as MVNOs without the need for any change in the frequency holdings of the incumbent MNOs, there is no doubt that MVNOs promote competition in the retail mobile telecommunications services market. However, the entry of new MVNOs would not be likely to increase competition in the upstream market for the provision of wholesale access to mobile networks. The businesses of MVNOs are also constrained to a large extent by the ability and certainty of acquiring the required network capacities from hosting MNOs and the prices they have to pay for sustainable business development. Without radio spectrum assignment, they cannot have the business option of building their own mobile networks to create the network capacities they need to deliver the type and quality of services they choose to provide. In a free and competitive market, service providers will have both the options of "buy" and "build". By making available spectrum for auction on a periodic basis upon expiry of spectrum assignments, those interested new entrants or MVNOs can have the choice of competing in the market as MNOs. Equipped with full autonomy in utilising the spectrum resources and in the building up of network infrastructure, they would be able to compete more effectively with the incumbent MNOs.

Section 5: Encouragement of Investment and Promotion of Innovative Services

5.1 The CA considers that the revised hybrid approach under Option 3 (which involves 40% of the 900/1800 MHz Spectrum being re-assigned to the incumbent spectrum assignees through the offer of a right of first refusal and 60% being re-assigned through auction, as proposed in the Second Consultation Paper) will most likely strike a balance between the need for a level of certainty for further investment and the achievement of the other objectives in spectrum re-assignment.

Views and Comments of the Respondents

5.2 In respect of the CA's proposal of re-assigning part of the 900/1800 MHz Spectrum by way of auction, CEG, HKT, Hutchison and ZTE opine that uncertainty as to future spectrum holdings in these two frequency bands would dampen their incentives to invest in network improvements and provision of new services. CEG is also concerned about this happening at a time when investment is mostly needed to cater for the rapidly growing demand. It regards variations to the existing spectrum holdings as potentially causing MNOs to discard network equipment dedicated for specific frequency bands and wasteful investment in network reconfiguration. CEG and Hutchison also point to the risk of diversion of investment resources by the incumbent MNOs from network improvements and service innovations to network reconfiguration in order to compensate for any loss in their spectrum holdings. In the case of part of the Auctioned Spectrum being taken up by new entrants, HKT expresses doubts about the new entrants' contributions to investment and introduction of innovative services and cites the case of 21 ViaNet as an example of new entrants not guaranteeing service innovations.

5.3 SmarTone agrees with the view of the CA in the Second Consultation Paper that the hybrid approach strikes a balance between the need for certainty for investment and meeting the other objectives in spectrum re-assignment. It opines that while the RFR Spectrum provides the certainty as required by the incumbent MNOs, the opportunity to adjust their spectrum holdings through auction also encourages investment and introduction of innovative services.

Responses of the CA

5.4 The CA recognises that a regulatory environment of certainty and predictability is important for encouraging investment in the mobile telecommunications market in Hong Kong. The promulgation of the Spectrum Policy Framework by the Government in April 2007 following a public consultation exercise provides the industry with a level of certainty about the Government's spectrum management policy. The Spectrum Policy Framework makes it clear that the policy inclination is to adopt a market-based approach in the management of spectrum wherever the CA considers that there are likely to be competing demands from providers of non-Government services. In addition, spectrum assignments under the TO are fixed-term assignments and the Spectrum Policy Framework makes it clear that there is no legitimate expectation of any right of renewal or right of first refusal upon the expiry of a spectrum assignment, and the decision on spectrum re-assignment would be made and notified to the assignee within a reasonable time before the expiry of the assignment.

5.5 The CA has consistently applied the above principles of spectrum management under the Spectrum Policy Framework in its spectrum assignment and re-assignment exercises, including the recent re-assignment of the 3G Spectrum in October 2016. Therefore, the CA considers that it should be within the expectation of MNOs that the 900/1800 MHz Spectrum will be subject to re-assignment upon the expiry of the existing assignments in 2020/21, and they should have factored this into their investment plans.

5.6 The CA would also like to clarify that, although there may be some uncertainty around future spectrum holdings pending the outcome of the assignments of the RFR Spectrum and the Auctioned Spectrum, it will not take, as some respondents have suggested, several years from the time of its submission to the second consultation for the matter to be settled. The arrangements for the re-assignment of the RFR Spectrum to the incumbent spectrum assignees are set out in paragraph 77 of the Statement. Subject to completion of the legislative process to amend the subsidiary legislation, the arrangements for the assignment of the Auctioned Spectrum will be known upon the completion of the auction targeted to take place around the end of 2018. This means that any uncertainty as to the outcome of the Re-assignment of the 900/1800 MHz Spectrum will only last for around one year and MNOs will have

more than two years to prepare for the actual re-assignment in 2021. Indeed, the 3G Spectrum re-assignment exercise followed a similar timeline. In addition, this timeframe would likely tie in with the timing for the industry's investment planning on fifth generation ("5G") networks and services, with frequency harmonisation and standard specification for International Mobile Telecommunications for 2020 and beyond or IMT-2020 expected to be released by 2019/20. Therefore, the CA considers that the proposed timing and arrangements for the Re-assignment of the 900/1800 Spectrum should enable MNOs to effectively plan their long-term investments.

5.7 In respect of the concern that changes in frequency holdings may result in "wasteful" investment in network reconfiguration, the CA would like to point out that the currently fragmented spectrum assignments in the 900 MHz and 1800 MHz bands will need to be re-organised anyway, as otherwise the benefits from the investment made for refarming those carriers of wider bandwidths to provide 3G, 4G or new generation of mobile services cannot be fully realised. The Re-assignment of the 900/1800 MHz Spectrum provides a long-awaited opportunity for spectrum in these two frequency bands to be consolidated into frequency slots of 2 x 5 MHz or 2 x 10 MHz to fit in with 3G, 4G or even 5G technologies. Therefore, the incumbent MNOs would in any event have to make investment in the necessary network reconfiguration after the fragmented frequency slots have been consolidated and re-assigned in the new assignment term such that higher spectral efficiency will be attained.

5.8 Further, as pointed out by CEG, there is an operational need for MNOs to reconfigure their networks from time to time in order to meet the growing demand and to match up with technological advancements. If, in the Re-assignment of the 900/1800 MHz Spectrum, the incumbent MNOs exercise their right of first refusal to acquire the RFR Spectrum (i.e. four frequency slots of 2 x 10 MHz in the 1800 MHz band), which are the slots that they are currently using, they can continue to use their existing network infrastructure for those slots. As for the spectrum in the 900 MHz band, the incumbent spectrum assignees are at liberty to aim for in the auction those frequency slots which they consider will require the least network reconfiguration and new infrastructure to be put in place.

5.9 The above discussion demonstrates that the present spectrum re-assignment exercise is likely to encourage investment by MNOs which is

necessary in any event for bringing about more efficient utilisation of the 900/1800 MHz Spectrum. Further, changes in frequency holdings as a result of auction will in fact stimulate investment. Some of the incumbent spectrum assignees indicate preference in their submissions for acquiring additional spectrum to achieve larger carrier bandwidth and/or for acquiring spectrum in the frequency band where they do not currently hold any spectrum. If they are successful in this, they will have to make investment to put the additional spectrum acquired to gainful use. In the case of spectrum acquired by new entrants, they will have to put in even more investment than the incumbent MNOs to construct the network infrastructure from scratch for efficient use of the newly acquired spectrum.

5.10 As regards the concern that incumbent assignees will divert their investment resources from network improvements and service innovations to network reconfiguration in order to compensate for the loss in spectrum holdings, the CA would like to point out that it is a matter of commercial consideration for MNOs as to how best they should prioritise their resources to enable them to compete effectively. Whilst some MNOs may find it more worthwhile to invest further in network improvement and innovation, others may devote a larger proportion of their resources on acquiring additional spectrum to expand their service capacity. This is a business decision that MNOs would need to make even if all of the spectrum were to be re-assigned administratively to the incumbent spectrum assignees under Option 1. They invariably need to decide how much they wish to pay for acquisition of the administratively re-assigned spectrum and how much to pay for additional network investment due to reduction in spectrum holdings.

5.11 The CA does not agree with the suggestion that investments by new entrants will only replicate those made by the incumbent MNOs. For example, the new fixed network operators (“FNOs”) which entered the fixed telecommunications market in the 1990s and 2000s have all invested in the fibre broadband networks, and none of them had replicated the copper network of the then incumbent FNO. There is also a possibility that, when new market players enter the mobile telecommunications market, they may employ state-of-art technologies to build their networks in order to provide innovative services and additional choices to mobile customers.

5.12 As for the case of 21 ViaNet, the CA has already given its responses

in the preceding sections and would only emphasize here that the auction of spectrum in the 2.3 GHz band conducted in 2012 has proved that there are indeed potential new investors who are interested in entering the local telecommunications market. The possibility that new market entrants could indeed make contributions to network investments and introduce innovative services cannot be precluded.

Section 6: Revised Option 3 - Spectrum Re-assignment Option Proposed for Further Consultation

6.1 Having taken into account the views and comments received in the first round of public consultation, the analysis and recommendation of the Consultant in the Study, and the pro and cons evaluation of the three options for the Re-assignment of the 900/1800 MHz Spectrum as proposed in the First Consultation Paper, the CA put forward a revised hybrid approach under Option 3 in the Second Consultation Paper for further consultation.

Question 1: What are your views on the proposals of the CA to adopt the hybrid administratively-assigned cum market-based approach for the Re-assignment of the 900/1800 MHz Spectrum, by re-assigning 2 x 10 MHz of spectrum in the 1800 MHz band to each of the incumbent spectrum assignees through the offer of a right of first refusal, based on the overriding public policy reasons of safeguarding the provision of 4G services in the Remaining MTR Stations, and ensuring territory-wide continuity of 2G services if demands exist post 2020/21, and re-assigning the rest of the 900/1800 MHz Spectrum by way of auction?

Views and Comments of the Respondents

6.2 Notwithstanding the reasoning provided by the CA for adopting the proposed revised hybrid approach under Option 3 for further consultation, two of the four MNOs (namely, HKT and Hutchison), as well as CEG and NTT continue to favour the full-fledged administratively-assigned approach under Option 1, which, they argue, is the only rational and reasonable choice, consistent with the best international practice in spectrum re-assignment, and is necessary for ensuring the continuity and quality of customer services. HKT relies on two reports on mobile spectrum licensing published by GSMA in 2014 and 2016 respectively to support its argument that there is a strong presumption of renewal where spectrum is already being used efficiently and the market is competitive. CEG, HKT, Hutchison, together with Comba, also claim that the incumbent assignees have a legitimate expectation of renewal of their assignments of the 900/1800 MHz Spectrum upon expiry. HKT argues that incumbent spectrum assignees have a legitimate expectation under the Spectrum Policy Framework

that there would be no re-farming or re-auctioning of the spectrum without the CA first conducting a cost-benefit analysis of the options under consideration. CEG argues that a regulatory impact assessment should be conducted.

6.3 CEG and HKT regard the hybrid administratively-assigned cum market-based approach (Option 3) proposed by the CA for further consultation as following a type of “command-and-control” approach and consider this to be inconsistent with the market-based approach mandated by the Spectrum Policy Framework and in breach of Article 5 of the Basic Law. The two respondents make a distinction between the assignment of newly released spectrum and the re-assignment of spectrum when determining what is required under the “market-based approach” for spectrum management as stipulated in the Spectrum Policy Framework. HKT considers that under a market-based approach, licences would be of indefinite duration or an expectation of renewal would exist, spectrum charges would be levied to simply cover administrative costs, and spectrum trading would also exist. HKT’s view is shared by CEG. In their view, an auction is a market-based approach only in the case of assignment of newly released spectrum, but not in the case of spectrum re-assignment. HKT also expresses doubt about the likelihood of competing demands for the 900/1800 MHz Spectrum, which is the yardstick for adopting the “market-based approach” for spectrum re-assignment according to the Spectrum Policy Framework, and urges the CA to prove that the actual demand for it exceeds the supply.

6.4 The other two MNOs (i.e. CMHK and SmarTone) support the adoption of the revised hybrid approach for the Re-assignment of the 900/1800 MHz Spectrum. They consider the revised hybrid approach can best meet the multiple objectives in spectrum re-assignment, and can allow MNOs and new investors the opportunities to acquire an amount of spectrum in accordance with their business objectives. Nokia, ZTE and one individual respondent also support Option 3. Other respondents are concerned about business continuity and high SUF in general, without expressing any preference for the spectrum re-assignment option.

Responses of the CA

6.5 The CA has conducted an evaluation (in paragraphs 24 – 44 of the Statement) of the relative performance of Option 1 and Option 3 in meeting the

multiple objectives in spectrum re-assignment, and has also responded to the comments received relating to the options for spectrum re-assignment by reference to the four objectives for spectrum re-assignment in Sections 2 – 5 above. In gist, the CA considers that the hybrid approach of re-assigning 2 x 10 MHz of spectrum in the 1800 MHz band through the offer of a right of first refusal to each of the incumbent spectrum assignees (40% of the 900/1800 MHz Spectrum in total) will be able to safeguard the provision of 4G services in the Remaining MTR Stations and also ensure the provision of territory-wide 2G services if the demands for such services remain post spectrum re-assignment in 2021, and will at the same time provide a reasonable degree of certainty for long-term investment. The re-assignment of the remaining 60% of the 900/1800 MHz Spectrum by auction is more likely to enable a more efficient use of the spectrum and contribute to the promotion of effective competition and introduction of innovative services.

6.6 The experience in the re-assignment and seamless handover of 3G Spectrum in October 2016 demonstrates that an advance notice of re-assignment of three years provides sufficient time for the industry to prepare for any variations in spectrum assignments and ensure that consumers enjoy continuous access to mobile services throughout the process.

6.7 As regards the suggestion that incumbent MNOs have a legitimate expectation of being re-assigned their current holdings of spectrum upon expiry of assignments, it should be pointed out that the Spectrum Policy Framework, promulgated by the Government in April 2007 following public consultation, clearly states that there should be no legitimate expectation on the part of the spectrum assignees that there will be any right of renewal or right of first refusal of any spectrum assignment upon expiry. HKT seeks to rely on the re-assignment of the same spectrum through the offer of a right of first refusal to the then incumbent spectrum assignees in 2005/06 as a precedent supporting the existence of a legitimate expectation. It is worth noting that the relevant decision of the former Telecommunications Authority in that case was made back in 2004, well before the promulgation of the Spectrum Policy Framework by the Government in 2007. Given the clear statement in the Spectrum Policy Framework that there can be no legitimate expectation of a right of renewal, the case quoted by HKT does not have any relevance to support its claim. In fact, with the advent of mobile broadband services over the past decade, the landscape of the mobile market nowadays is fundamentally different from that in 2004.

The demand for mobile spectrum is much more acute today along with the tremendous growth in mobile data usage. The guidance given by the Spectrum Policy Framework is relevant and appropriate for considering the spectrum re-assignment arrangement under the present market situation.

6.8 Spectrum scarcity has meant that increasingly economies around the world are adopting an auction or market-based approach to spectrum re-assignment upon expiry of assignments to ensure that spectrum will be assigned to the parties which are expected to be able to put it to the most efficient use⁹. Accordingly, HKT's argument that there would be a strong presumption of renewal where spectrum is already being used efficiently and the market is competitive has no basis. Even the GSMA report entitled "Best Practice in Mobile Spectrum Licensing" published in September 2016 and submitted by HKT as part of its submission to the Second Consultation Paper points to the fact that there is no such presumption: "*there is no single best assignment approach but rather a need to assess the merits of each on a case-by-case basis. Auctions are most suitable when there is excess demand for the spectrum and hence the benefit of auctions in awarding spectrum to the operators which are most likely to put it to the best use helps maximise benefits to society*" (emphasis added).

6.9 The CA has clearly established the likelihood of competing demands (or "excess demand" according to the terminology used in the GSMA report quoted above) for the 900/1800 MHz Spectrum, as it explained in the First Consultation Paper and then affirmed in the Second Consultation Paper. This is in view of the sustained robust growth in mobile data usage, the good propagation characteristics of spectrum in the 900 MHz band and the 1800 MHz band being the core band for the provision of 4G services.

6.10 Mobile data usage grew by two to five times every year between 2007 and 2011. It then grew further from 7,674 Terabytes ("TB") (or 1.1 Gigabytes ("GB") per capita) per month at the end of 2012 to 28,836 TB (or 3.9 GB per capita) per month in August 2017. The submissions of CEG, HKT and

⁹ According to the survey of international approaches to mobile spectrum licence renewal provided by CEG in Section 3 of its submission to the Second Consultation Paper, 14 out of the 26 spectrum re-assignments conducted during 2011-17 were through the full auction or hybrid approach, while it was only four out of 13 during 2006-10. In fact, the re-assignment made by Sweden in 2011 was a hybrid approach, instead of administrative re-assignment as classified by CEG. On this basis, 15 out of the 26 economies quoted by CEG for the period 2011-17 had re-assigned spectrum using the full auction or hybrid approach. In addition, we have identified for the period that the following economies had also re-assigned spectrum upon expiry using the full auction or hybrid approach, viz. Portugal (2011), Austria (2013), Taiwan (2013), Thailand (2013), Singapore (2016), and India (2016).

Hutchison all affirm their expectation that mobile traffic or data usage will grow even faster than has been assumed by the Consultant in the Study. The industry is keen to acquire additional spectrum to support the ever growing number of mobile broadband users and the provision of large bandwidth services. In the submissions of CMHK and SmarTone to the Second Consultation Paper, the two MNOs either directly or indirectly indicate demands for additional 900/1800 MHz Spectrum under the hybrid spectrum re-assignment approach. Also, both HKT and SmarTone have urged the Government on different occasions for early release of more spectrum to meet the demand of future mobile services. There is thus no doubt about the likelihood of competing demands for the 900/1800 MHz Spectrum.

6.11 On the claim for legitimate expectation under the Spectrum Policy Framework of a cost-benefit analysis, it should be pointed out that neither the Spectrum Policy Framework nor the TO has imposed such a requirement on the CA in relation to the Re-assignment of the 900/1800 MHz Spectrum. The requirement for the conduct of a cost-benefit analysis in paragraph 4.4 of the Spectrum Policy Framework refers to the situation of varying or withdrawing the spectrum assignment to enable the vacated spectrum to be used more efficiently or allocated to another higher value use¹⁰, and is not relevant to the present re-assignment exercise. In any event, the CA has conducted pros and cons evaluations of the three spectrum re-assignment options against the multiple policy objectives in spectrum re-assignment in the two rounds of public consultation. The incumbent spectrum assignees have been given adequate opportunities to make submissions on these evaluations or to put forward their own evaluations which the CA would take into account in making its decision on spectrum re-assignment.

6.12 The request for the conduct of a regulatory impact assessment is also considered irrelevant in the context of the Re-assignment of the 900/1800 MHz Spectrum, as it does not involve any change in the regulatory approach in regard to spectrum management or re-assignment. The adoption of a market-based approach for the management of the spectrum with competing demands, unless there are overriding public policy reasons to do otherwise, has been in place since the promulgation of the Spectrum Policy Framework in April 2007. As such, there is no change in the regulatory regime that warrants an impact assessment.

¹⁰ See paragraph 18 of the Legislative Council Brief on Proposed Spectrum Policy Framework – Outcome of Consultation published on 24 April 2007 (available at: http://www.cedb.gov.hk/ccib/eng/legco/pdf/legco_spectrum.pdf).

6.13 The CA does not agree with the terminologies coined by HKT to describe the hybrid approach under Option 3 as a “command-and-control approach”, whilst referring to the full-fledged administratively-assigned approach under Option 1 as a “market-based approach”. Such terminologies are not only novel, unconventional and arbitrary, but they also serve to confuse and detract from a proper analysis of the subject matter at hand. There is also no basis for HKT’s allegation that the adoption of Option 3 would be in breach of Article 5 of the Basic Law due to the CA’s “abandonment” of (using HKT’s terminologies) the “market-based approach” and application of a “command-and-control approach” for spectrum management in this re-assignment exercise. In fact, administrative assignment or re-assignment of spectrum is commonly referred to as the command-and-control approach. The hybrid administratively-assigned cum market-based approach adopted for the Re-assignment of the 900/1800 MHz Spectrum, as explained in paragraph 6.14 below, is a market-based approach.

6.14 The Spectrum Policy Framework specifies that a market-based approach relies on market forces to ensure the efficient use of spectrum as a public resource and it should be adopted for management of spectrum where there is a likelihood of competing demands. No distinction is made between the management of newly released spectrum and re-assigned spectrum. Auction, as a major component of Option 3, when applied to spectrum re-assignment upon expiry, with “who” gets “what amount of spectrum” and “at what prices” all determined by the competitive bidding process is clearly a market-based approach to spectrum assignment. Contrary to HKT’s allegation, Option 1 with all spectrum re-assigned to the incumbent assignees according to their existing holdings and the level of SUF to be charged for the re-assignment all determined on an administrative basis, does not embody in it any elements or features commonly accepted as being constituents of a market-based approach to spectrum re-assignment.

6.15 The suggestion of CEG and HKT that there is a “take back” or “withdrawal” of spectrum is baseless, as the Re-assignment of the 900/1800 MHz Spectrum will only take place upon (and not before) expiry of the existing assignment terms. Once the current assignment terms have come to an end, the incumbent assignees are not entitled to claim any right or privilege to continue holding the spectrum concerned. The incumbent spectrum assignees

can however freely participate in the auction to be conducted well before expiry of the current assignment term, and decide, even before the auction is conducted, whether or not to exercise the right of first refusal to acquire the RFR Spectrum based on their own commercial considerations.

Section 7: Spectrum Utilisation Fee

7.1 In the Second Consultation Paper, SCED proposed that the respective SUF of the Auctioned Spectrum in the 900 MHz and 1800 MHz bands would be determined by auction, and in setting the auction reserve price for both bands, reference could be made to the auction reserve prices for the two most recent auctions in respect of the spectrum in the 2.5/2.6 GHz band and the 3G Spectrum conducted in March 2013 and December 2014 respectively, with the latter carrying a greater reference value. SCED has also proposed to set just one auction reserve price for spectrum in both the 900 MHz and 1800 MHz bands, since spectrum in the two bands may be equally or similarly attractive to the industry taking into account the radio propagation characteristic of the 900 MHz band and the availability of equipment and user devices supporting the 1800 MHz band for the provision of 4G services.

7.2 For the RFR Spectrum in the 1800 MHz band, SCED proposed that the SUF should be set at the average SUF of the Auctioned Spectrum in the 1800 MHz band, subject to a minimum price and a cap. In setting the minimum price, reference could be made to the level of SUF for spectrum in the 2.5/2.6 GHz band as determined by auction conducted in March 2013 and that for the 3G Spectrum as determined in the re-assignment exercise in 2014, with the latter carrying a greater reference value. The cap should be set at 30% to 40% higher than the minimum price.

7.3 Regarding the method of payment, SCED proposed that MNOs would be given a choice to pay the SUF in lump sum payment upfront or by annual instalments.

Question 2: What are your views and comments on the methods of setting the SUF as proposed in paragraphs 92 – 100 of the Second Consultation Paper?

Question 3: What are your views and comments on the method of payment of SUF?

Views and Comments of the Respondents

7.4 HKT, Hutchison, CMHK, a number of company respondents (Airbus,

SKL, Simpson Marine, Magtague, MaBelle, Nittel, Comba, H+S, Nokia) and several individuals consider that SCED should not set the SUF at a high level or increase the existing SUF level as SUF would be passed on to consumers. Some are of the view that a high level of SUF would impose a heavy cost burden on the MNOs, affect quality of services and/or result in job-cutting. HKT specifically mentions that SUF represents 12.2% of its mobile service operating costs in 2016. Some respondents hold the view that the Government should not seek to maximise revenue when making decisions on SUF. Hutchison asks the Government to provide a response to its enquiry on whether SUF is a type of spectrum tax or Government levy.

7.5 Some company respondents (Airbus, SKL, Simpson Marine, Magtague, MaBelle, Nittel, Nokia, ZTE) mention that the level of SUF in Hong Kong stands out as one of the highest on a global scale. Hutchison considers that apart from local benchmarks, international benchmarks are indispensable in determining a reasonable level of SUF. GSMA is concerned about our plan to use only benchmarking and to only benchmark against past local auctions without meaningful adjustment and ignoring present market situation such as MNOs' on-going investment in 4G and heavy investment in preparing for 5G. Comba notes that mobile telecommunications infrastructure investments are significant, and high SUF would affect MNOs' capability to continue to invest and introduce more innovative technology. Huawei considers that having a reasonable SUF would help inspire more financial and manpower investment into the telecommunications industry, helping to provide a platform with a plethora of professionals for Hong Kong's upcoming 5G era. Nokia considers that high SUF would not only reduce MNOs' investments on network development but would also potentially hinder the development of innovation on mobile services and applications. H+S and ZTE share similar views that high SUF would discourage investment in new technology and services.

7.6 On the auction reserve price, HKT suggests that it would not be necessary to set the reserve price at a high level in order to allow sufficient room for bidders in the spectrum auction to discover the true value of the spectrum, and it sees no reason why the auction reserve price cannot be set at zero. GSMA shares similar views and considers the auction reserve price should be set below a conservative estimate of true market value of spectrum to enable price discovery. SmarTone opines that it would not be desirable to set high auction reserve price, or it would run the risk of intervening with market forces in

determining an economically efficient price for the spectrum. It also suggests that for the auction of 3G Spectrum conducted in 2014, the average final price is only 2.5% higher than the auction reserve price, indicating that the reserve price is set too high, and therefore SCED's proposal to set the auction reserve price close to that for 3G Spectrum would run the risk of the price being set at an excessively high level. SmarTone counter-proposes that the auction reserve price can be set at the average of the two reference values proposed by SCED, or by making reference to international benchmarks. Hutchison is of the view that the proposed auction reserve price is high when compared to the pricing for similar bands in other jurisdictions.

7.7 On the minimum price for RFR Spectrum, HKT suggests that such price would not be necessary as incumbents who elect to take up the RFR Spectrum can simply be asked to pay the average SUF fetched for Auctioned Spectrum. This would eliminate the difficult task of determining a sensible price and ensure that the price of RFR Spectrum would be on par with that of the Auctioned Spectrum. HKT adds that SCED should not make reference to the SUF paid for the RFR Spectrum in the 3G Spectrum band since there is an element of monopoly hold-up pricing in that auction as incumbents sought to retain spectrum holdings they had invested substantial sums in to provide services to existing customers. Hutchison considers that the proposal of setting the minimum price at a higher level than the auction reserve price is one-sided in favour of the Government and prejudicial to incumbents. It proposes that a downward price adjustment mechanism should be in place in the event that the final price for the Auctioned Spectrum is lower than the minimum price for RFR Spectrum by more than a specific percentage. CMHK is of the view that the minimum price should be reduced. SmarTone notes that the SUF for 3G Spectrum is significantly higher than most of the compared auctions worldwide, and suggests that the minimum price could be set at the average of the two reference values proposed by SCED.

7.8 On the cap for RFR Spectrum, HKT considers that setting the cap at 30% to 40% higher than the minimum price for RFR Spectrum is arbitrary and seems high. Hutchison also considers that the cap is too high.

7.9 As regards the proposal to adjust the reference values by inflation, HKT considers that they should only be uplifted to 2018 but not 2021 level given that the auction for the 900/1800 MHz Spectrum would take place in 2018.

7.10 On the method of payment, all four MNOs welcome the option of paying the SUF by annual instalments, with HKT further suggesting to remove the option of lump sum payment upfront. HKT, Hutchison and CMHK propose that the annual payment should be in the form of royalty payment linked to the revenues of the MNOs.

7.11 Hutchison and SmarTone state again their position that SUF should be treated as tax-deductible. CMHK requests that a paragraph should be included in the Information Memorandum to provide certainty on the tax-deductibility of SUF payment.

Responses of SCED

7.12 Frequency spectrum is a scarce public resource. To maximise its benefit to the community, SCED is duty bound to set the SUF at a level to reflect the full market value of the spectrum. This will ensure the spectrum resource is put into the hands of the MNOs which value it the most and which will consequently put it to the most efficient use.

7.13 It is not SCED's intention to set the SUF at a high level. Nor is it his intention to set the SUF at a level that maximises Government revenue. And, by virtue of section 32I of the TO, SUF is a fee payable by the users of the spectrum for the use of spectrum. It is neither a "spectrum tax" nor "Government levy" as suggested by Hutchison.

7.14 SCED has duly noted the concern of a number of respondents about the impact of SUF on retail price, quality of services, investment, the financial burden on the MNOs, etc. As reiterated above, in setting the SUF, it is not the intention of SCED to pitch it at a high level or to seek to maximise Government revenue. In the final analysis, the amount of SUF payable is purely a commercial decision of the MNOs, as they, having taken into account all relevant factors (including their own financial positions and the market environment), consider accepting or otherwise the RFR Spectrum they are offered; and as they consider whether, and if so, how far along they would take part in the competitive bidding for the Auctioned Spectrum. On service charges, in a keenly competitive mobile service market as in Hong Kong, adjustments in service charges are determined by the market forces rather than on the basis of cost variations. Worthy of note

is that of the eight spectrum auctions that have taken place since 2001 through which the market prices for the spectrum in question were established, though the level of SUF reached a record high of \$98 million per MHz on but one particular occasion, which was the outcome of the acutely intense competitive bidding at the time among the MNOs, mobile service charges in Hong Kong have remained highly affordable and competitive by international standards throughout these years.

7.15 As regards HKT's claim that SUF represents 12.2% of its operating costs in 2016, it is noted from the supplementary information the company provides that it has, in arriving at the percentage share, chosen to depart from the conventional accounting practices and exclude depreciation and amortisation (other than SUF) from the cost base. The calculation this way would have the effect of magnifying the share of SUF in HKT's operating costs. Had the conventional accounting practices been followed, we have reasons to believe that the percentage constituted by the SUF would be much lower than the stated 12.2%.

7.16 In relation to this, according to the operational data obtained by OFCA from the MNOs, SUF accounts for around 3-4% of the MNOs' overall operating expenses on average when depreciation and amortisation are included, and the amount of SUF attributable to the 900/1800 MHz Spectrum is even less (below 1%). In other words, even if the SUF of the 900/1800 MHz Spectrum is adjusted in the new spectrum assignment term starting from 2021, it is highly questionable that its effect on the operating expenses of the MNOs is such that it would exert significant pressure on service charge increases.

7.17 SCED notes suggestions that international benchmarks should be taken into account when setting the level of SUF. SCED remains of the view that it would be more relevant and appropriate to set the SUF based on Hong Kong's past market benchmarks in order to reflect the unique local circumstances (such as local business environment and the associated cost of building and maintaining a mobile network locally). Given the small geographical size of the territory and the high population density, the network rollout cost on a per customer basis in Hong Kong should be much lower than those in most other economies. Besides, the high mobile penetration rate of above 230% in Hong Kong contributes positively to MNOs' revenue. That said, SCED agrees with GSMA that when we make reference to local benchmarks, suitable adjustments

should be made taken into account the prevailing market situation. SCED also shares the view as in some submissions that the MNOs' ability and willingness to invest in new and innovative technologies should be factored into the consideration process of SUF setting. In particular, SCED notes that with the anticipated launch of 5G mobile services in around 2020, MNOs will need to invest substantial resources into constructing the network infrastructure which may impact upon their budgetary planning and financial arrangements as regards the competitive bidding for 900/1800 MHz Spectrum in the current exercise. He has fully taken this into account in setting the auction reserve price and the minimum price of the RFR Spectrum.

7.18 As to the claim that the level of SUF in Hong Kong is one of the highest in the world, it is not borne out by the findings of a research conducted by OFCA into the spectrum auctions conducted by overseas jurisdictions between 2009 and 2017. As can be seen from the chart in the [Appendix](#), the levels of SUF in Hong Kong of spectrum in the 1800 MHz, 1.9 – 2.2 GHz, 2.3 GHz, and 2.5/2.6 GHz bands auctioned between 2009 – 2014 are all within the range of SUF levels of similar frequency bands in auctions conducted overseas.

7.19 It is necessary to point out that the reference SUF level often referred to by respondents in making the above allegation is the SUF of the 20 MHz of spectrum in the 850/900 MHz band as determined by auction conducted in March 2011. The level of SUF reached reflects the scarcity of the sub-1 GHz spectrum and the limited amount of spectrum put out for auction on that particular occasion, and it serves but to represent the market value of the spectrum the prevailing time.

7.20 On auction reserve price, SCED does not see any justifications for setting it at zero. The auction reserve price has the important function to shed light on the potential value of the spectrum and to forestall non-serious bidders. SCED remains of the view that the auction reserve price should be set at a level that represents the minimum base value of the Auctioned Spectrum for the purpose of kick-starting the competitive bidding process.

7.21 SCED notes a suggestion that it is not necessary to set a minimum level for the RFR Spectrum and that the relevant SUF could simply be the average SUF for the Auctioned Spectrum. SCED considers such a suggestion

fraught with difficulties in point of principle. As explained in the Second Consultation Paper, the minimum price for RFR Spectrum and the auction reserve price involve two separate concepts which serve different purposes. The former is the minimum fee an incumbent spectrum assignee is required to pay in order to be entitled, and to be able to exercise the right of first refusal to be re-assigned parts of its current spectrum holdings with certainty (i.e. without the risk of entering into any competitive bidding process), whereas the latter represents the minimum base value of the relevant spectrum for the purpose of kick-starting a competitive bidding process. The certainty in respect of spectrum re-assignment that is afforded the incumbent spectrum assignees explains why the minimum SUF for the RFR Spectrum should be set at a level different from, and in fact should in all circumstances be above, the auction reserve price of the Auctioned Spectrum, upon which rounds of competitive biddings would be based. It is evident that the two concepts are distinctly different and any suggestion to link the minimum level of the SUF for RFR Spectrum arbitrarily with whatever fractions of the SUF of the Auctioned Spectrum is misguided and should not be acceded to.

7.22 On the suggestion that reference should not be made to the SUF paid for the RFR Spectrum in the 3G Spectrum band, SCED remains of the view that the value of the RFR Spectrum in the 3G Spectrum band which was taken up by the MNOs in 2016 is relevant as it is the most recent indication of the market value that MNOs are willing to pay for acquiring the spectrum in a keenly competitive telecommunications market in Hong Kong.

7.23 SCED disagrees with the saying that the setting of the minimum price is one-sided in favour of the Government and is prejudicial to incumbents. The incumbent spectrum assignees are free to make their commercial decision on whether or not to exercise their right of first refusal for the RFR Spectrum. If they do so, they will be afforded the certainty of being re-assigned parts of their current spectrum holdings which is made subject to a cap on the SUF that they are going to pay, well before their taking part in the subsequent competitive bidding process for the Auctioned Spectrum. Albeit one may not preclude the possibility that they may end up paying for their share of the RFR Spectrum at a level of SUF higher than that in respect of the amount of Auction Spectrum they finally acquire, in the event that the SUF of the Auctioned Spectrum is lower than the minimum price of the RFR Spectrum, this is a commercial risk that they need to take into account. If MNOs do not wish to take that commercial risk

after all, the option is always open for them not to accept the RFR Spectrum offered by the CA and choose instead to compete with all other bidders in the auction in the hope that they may be able to secure their desired amount of Auctioned Spectrum at a lower SUF through bidding. The choice is entirely for the MNOs to make.

7.24 As to the cap for RFR Spectrum, SCED considers that its key function and purpose is to provide certainty for the incumbent spectrum assignees on the maximum level of SUF they would be subject to, at the time when they have to decide on whether to exercise their right of first refusal, which is well before the conduct of the auction. Taking into account the experience of the 3G Spectrum re-assignment exercise, SCED considers that the proposed cap is appropriate.

7.25 Regarding the suggestion that the reference values should be uplifted to 2018 rather than 2021 price level, SCED notes that while the auction is tentatively scheduled to be held around the end of 2018, the MNOs will not be required to pay the SUF until the beginning of the new term of assignments, i.e. 2021. For that reason, it is appropriate to set the reference values to 2021 price level.

7.26 As to the payment method, SCED notes that all the MNOs welcome the choices given, and between lump sum payment and annual instalments, they all opt for paying the SUF in annual instalments. Regarding the annual royalty payment approach which links the amount of SUF to revenues of the MNOs, not only is it not the common international practice, the approach would impose administrative costs on both the Government and the MNOs in implementing accounting separation to ensure that all relevant revenues are suitably apportioned in the calculation of royalty payments. OFCA and MNOs will need to discuss and agree on the segregation methodology for determining network turnover attributable to different frequency bands. Past experience indicates that this accounting separation and reporting processes are resource-consuming and difficult to implement for both OFCA and MNOs. For the present re-assignment exercise, SCED notes the MNOs' concern about the need to pay a potentially huge amount of SUF upfront, and has therefore given MNOs the option to pay SUF by annual instalments if they wish to spread the SUF payment over the whole spectrum assignment period.

7.27 On the issue of tax deductibility, it is fundamentally a matter of tax

policy separate from and independent of SCED's consideration of the method for determining the levels of SUF and method of payment. In this regard, Inland Revenue Department has confirmed that SUF will be regarded as capital expenditure and is hence not tax deductible irrespective of the method of payment (i.e. whether in the form of lump sum payment or annual instalments). If MNOs have further enquiries on this issue, they should seek the advice of their own tax advisors and take such advice into consideration when making decisions relating to their investment in the present spectrum re-assignment exercise.

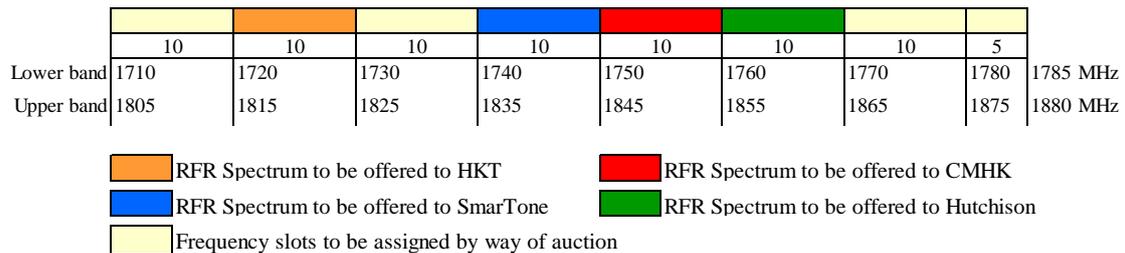
Section 8: Framework for Spectrum Re-assignment

8.1 The CA posed in the Second Consultation Paper five questions relating to the framework for the Re-assignment of the 900/1800 MHz Spectrum using the proposed hybrid administratively-assigned cum market-based approach under Option 3.

Band Plans and the Location of the RFR Spectrum

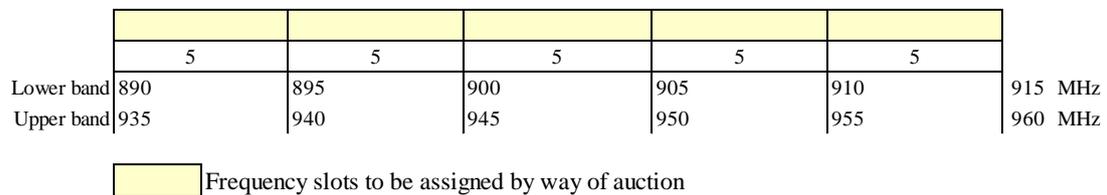
Question 4: *What are your views on the band plan proposed below for the re-assignment of the 2 x 75 MHz of spectrum in the 1800 MHz band? Would you consider the proposed frequency slots to be re-assigned to individual incumbent spectrum assignees as the RFR Spectrum an optimal arrangement from the industry’s point of view?*

Figure 1: Proposed Band Plan for the 1800 MHz Frequency Band



Question 5: *What are your views on the band plan proposed below for the re-assignment of the 2 x 25 MHz of spectrum in the 900 MHz band?*

Figure 2: Proposed Band Plan for the 900 MHz Frequency Band



Views and Comments of the Respondents

8.2 All the four MNOs support the band plans proposed by the CA for the re-assignment of 2 x 75 MHz of spectrum in the 1800 MHz band and 2 x 25 MHz of spectrum in the 900 MHz band. With the originally fragmented frequency assignments consolidated into slots of 2 x 5 MHz or 2 x 10 MHz, HKT regard the two proposed band plans as reasonable in ensuring spectral efficiency. SmarTone considers them as compatible with carrier bandwidths required for the 2G, 3G and 4G technologies and hence suitable for immediate use by the industry and also for use with other technologies in the future. SmarTone is also of the view that the band plan proposed for the 1800 MHz band would improve spectral efficiency by allowing most of the incumbent MNOs to acquire a contiguous slot of 2 x 20 MHz.

8.3 As to the locations of the four slots of RFR Spectrum in the 1800 MHz band proposed by the CA to be re-assigned to the incumbent spectrum assignees through the offer of a right of first refusal, it has the support of all MNOs. CMHK, HKT and SmarTone point out in particular that the arrangement would minimise the reconfiguration work required for the IRS at the MTR premises if the incumbent spectrum assignees exercise the right of first refusal to acquire the RFR Spectrum, and is thus considered an optimal arrangement.

Responses of the CA

8.4 The CA notes the support of the industry for the band plans proposed for the 900 MHz and 1800 MHz frequency bands respectively, including the locations of the frequency slots in the 1800 MHz band proposed to be re-assigned to the incumbent spectrum assignees through the offer of a right of first refusal. The above two band plans will be adopted for the assignment of the 900/1800 MHz Spectrum in the new term of spectrum assignment, as detailed in paragraphs 76 and 82 of the Statement.

Auction Format

Question 6: What are your views on the use of the Simultaneous Multiple Round Ascending (“SMRA”) format that has been adopted in the spectrum auctions held by the CA in recent years to auction off the Auctioned Spectrum in the 900 MHz and 1800 MHz bands?

Views and Comments of the Respondents

8.5 Hutchison and SmarTone have no objection to the use of the SMRA format proposed to be adopted in the auction to be conducted for the re-assignment of part of the 900/1800 MHz Spectrum. Without prejudice to its contention that Option 1 should be adopted for spectrum re-assignment, HKT considers that if an auction were to take place, it would favour this auction format due to the familiarity of it by the whole industry. As for CMHK, it is neutral on the matter.

Responses of the CA

8.6 The CA notes the support of the industry in general for the SMRA auction format, and will adopt it in the auction to be conducted for the assignment of the Auctioned Spectrum, with details provided in paragraph 86 of the Statement.

SC on the Phasing out of 2G and Other Generations of Mobile Services

Question 7: What are your views on the proposed SC requiring all licensees to seek the prior consent of the CA and to make proper arrangements for the affected customers before phasing out their provision of 2G services and other generations of mobile services in the future?

Views and Comments of the Respondents

8.7 HKT and Hutchison regard the proposed SC as a regulatory restriction on the shutting down of legacy networks which is unnecessary and inconsistent with the technology-neutral and market-led approach advocated by the CA. HKT considers that the CA has exaggerated the concern about 2G services and

that General Condition (“GC”) 5 on Provision of Service already provides sufficient safeguards on service provision. GSMA holds the same view as HKT with regard to the relevance of GC 5 in the present context, and is concerned about the proposed SC creating additional impediments to further innovations in mobile services. HKT does not find it appropriate to introduce through the present consultation exercise a requirement which would apply across the board to other generations of mobile services. Hutchison points to the practice in some other economies that 3G services would be shut down before 2G services.

8.8 SmarTone welcomes the move of the CA from the original proposal of a three-year transitional period for 2G services to the introduction of the proposed SC, as it will provide flexibility to MNOs in phasing out 2G services based on their own commercial considerations. However, it points out that the new SC should not prevent MNOs from using the assigned spectrum for more advanced technologies, and urges OFCA to take a more proactive role in facilitating the phasing out of 2G services.

Responses of the CA

8.9 As explained by the CA in the Second Consultation Paper, pursuant to the proposed new SC, an MNO may decide whether or not and if so, when to phase out its provision of 2G services based on its own commercial considerations, provided that before doing so it has put in place reasonable and appropriate arrangements for the affected customers to the satisfaction of the CA. It may migrate its 2G service subscribers to 3G or 4G services, or continue the provision of 2G services using the networks of other MNOs by entering into relevant wholesale or other forms of commercial arrangements. As these are all market-led decisions to be made by the MNOs, the proposed SC should not be regarded as a regulatory restriction on the shutting down of legacy mobile networks. Also, with the 900/1800 MHz Spectrum continuing to be assigned on a technology-neutral basis, coupled with the flexibility MNOs have in service provision, the CA does not consider that the new SC will impede the introduction of innovative services by MNOs.

8.10 On the applicability of the new SC to the phasing out of any generation of mobile services, the CA considers it appropriate to construct the new SC in a general manner, as the phasing out of any generation of mobile services in future would likely give rise to similar consumer concerns and should

therefore be subject to similar regulatory oversight. As pointed out by Hutchison in its submission, some economies are planning to phase out the provision of 3G services before that of 2G services. The CA nevertheless considers it necessary to safeguard the interest of mobile service subscribers in general. Further, according to section 7A of the TO, the CA may attach SCs, which are consistent with the TO and not inconsistent with the prescribed GCs, to a licence that it is empowered to issue, including a UCL. For details about the new SC to be incorporated into the UCLs of the incumbent MNOs and any new entrants, please see paragraphs 96 – 97 of the Statement.

8.11 On the relevance of GC 5 in the context of phasing out of legacy mobile services by MNOs, please refer to paragraph 98 of the Statement. Basically, as GC 5 is *ex post* in nature, it may not be adequate to safeguard a satisfactory phasing out of a generation of mobile services by MNOs in a well planned manner. The new SC will ensure that reasonable and appropriate arrangements have been put in place in an *ex ante* manner for the affected customers before the relevant networks are shut down by the MNOs.

Other Views on the Proposed Framework for Spectrum Re-assignment

Question 8: Do you have any views on other aspects of the proposed framework for the Re-assignment of the 900/1800 MHz Spectrum not explicitly asked in the questions set out in the paragraphs 103 – 121 of the Second Consultation Paper?

Views and Comments of the Respondents

8.12 CMHK suggests frequency swapping among MNOs be allowed, as it will not be able to form a contiguous slot of 2 x 20 MHz in the 1800 MHz band even if it has exercised the right of first refusal offered to it to acquire the RFR Spectrum.

8.13 In relation to the proposed spectrum cap, HKT reiterates its view that there are no real competition grounds to impose any cap on the amount of the 900/1800 MHz Spectrum that could be acquired by a single bidder in auction, as the amount of mobile broadband spectrum being considered forms less than one-third of the total spectrum which is being deployed for mobile broadband services. On the size of the spectrum cap to be imposed in the auction to be

conducted for the Re-assignment of the 900/1800 MHz Spectrum, SmarTone suggests that the overall cap should be lowered from 90 MHz to 80 MHz based on a market share threshold of 40% for the 200 MHz of 900/1800 MHz Spectrum to be re-assigned. CMHK suggests an even lower overall cap of 70 MHz.

8.14 HKT further suggests extending the existing assignment terms for the 900/1800 MHz Spectrum by five years, so that the industry would have a better idea about the timing and the arrangements for the release of the spectrum in the other frequency bands as mentioned in the press release of the CA on 21 March 2017. In this connection, CMHK suggests OFCA to consider auctioning the 900/1800 MHz Spectrum and the spectrum in these other frequency bands simultaneously.

Responses of the CA

8.15 The CA has stated its views on the issue of frequency swapping in paragraphs 80 and 82 of the Statement. Basically, swapping of all the frequency assignments in the 900 MHz and 1800 MHz bands will not be allowed in the first five years of the new assignment term. With regard to the swapping of the frequency assignments in the 1800 MHz band involving the RFR Spectrum, the CA's added concern is on the impact on the continuity of customer services in the Remaining MTR Stations.

8.16 On the issue of imposition of a spectrum cap in the auction to be conducted, the CA is of the view that, with at least 120 MHz of spectrum (or one-fifth of the total spectrum assigned) to be offered in a single auction, competition concerns could arise if the auction results in possible concentration of a substantial share of spectrum in the hand of a single MNO, hence the need for the cap.

8.17 As to the level of the cap to be applied, the CA notes the proposals of CMHK and SmarTone in their responses to the Second Consultation paper, and also Hutchison's responses to the First Consultation Paper, urging for a lower overall cap. Although HKT does not support the imposition of a spectrum cap, it strongly advocates Option 1 (administrative re-assignment) in its submissions to the two rounds of public consultation, under which it would be entitled to nothing more than re-assignment of its current holding (of 89.4 MHz) of the 900/1800 MHz Spectrum. Against the above, the CA's considered view is that

the overall cap of 90 MHz will provide the opportunity for the incumbent MNOs to acquire at least the same amount of the 900/1800 MHz Spectrum that it currently holds, thereby striking a balance between guarding against undue concentration of spectrum in the hands of some MNOs and the likely spectrum needs of each of the incumbent MNOs. In the event of entry of new players to the mobile telecommunications market, such a level of spectrum will also enable them to acquire an amount of spectrum necessary for the provision of a territory-wide network coverage.

8.18 On the timing for the auction and Re-assignment of the 900/1800 MHz Spectrum and its relationship with the auction and assignment of spectrum in the other frequency bands, it should be pointed out that due process needs to be followed, which also takes time, before the CA is in a position to release spectrum in the 3.5 GHz, 26 GHz, and 28 GHz bands for commercial deployment¹¹. Bearing in mind the pace of development for technical standards and specifications for the provision of 5G services, the current plan of the CA is to release such additional spectrum in batches after the assignment and licensing approach to be adopted has been determined. Any such assignments are expected to be granted from 2019 at the earliest, to take immediate effect. On the other hand, in order to give sufficient time for the incumbent assignees to prepare for any variations in their existing assignments of the 900/1800 MHz Spectrum before expiry of those assignments, the CA plans to conduct an auction for the assignment of the Auctioned Spectrum in about one year's time from the issue of this Statement (i.e. around the end of 2018), viz. about two years before the start of the new term of assignment in 2021, taking into account the drafting and passing of the required legislation and other preparatory work. Since different spectrum assignment exercises involve different timeframes required for the assignment decisions to be made and for the new assignments to become effective, and in the interest of avoiding delay to these exercises, it is not desirable to pool together the Auctioned Spectrum in the 900 MHz and 1800 MHz frequency bands with the newly released spectrum in other frequency bands for assignment through a single auction.

8.19 Following completion of the auction, which is expected to be held in around the end of 2018 for the assignment of the Auctioned Spectrum, the

¹¹ The press release of the CA on 21 March 2017 concerning “*Work Plan for Making Available Additional Radio Spectrum to Meet the Demand of Public Mobile Services Towards 2020 and Beyond*” is available at:
http://www.coms-auth.hk/en/media_focus/press_releases/index_id_1423.html.

incumbent MNOs and any new entrant will have clear information about their holdings of the 900/1800 MHz Spectrum in the new assignment term and thus also the amounts of their overall spectrum holdings. They may then deliberate on the acquisition of additional spectrum in the frequency bands newly designated for the provision of public mobile telecommunications services, including 5G services, when the additional spectrum is released to the market which is tentatively expected to start in 2019.

Communications Authority
Secretary for Commerce and Economic Development
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