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GENERAL NOTICES • ALGEMENE KENNISGEWINGS

INDEPENDENT COMMUNICATIONS AUTHORITY OF SOUTH AFRICA**NOTICE 697 OF 2020**

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**REASONS DOCUMENT RELATING TO THE INVITATION TO APPLY ON THE
LICENSING PROCESS FOR INTERNATIONAL MOBILE
TELECOMMUNICATIONS IN RESPECT OF THE PROVISION OF MOBILE
BROADBAND WIRELESS ACCESS SERVICES FOR URBAN AND RURAL
AREAS USING THE COMPLIMENTARY BANDS, IMT700, IMT800, IMT2600
AND IMT3500**

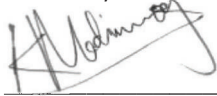
BACKGROUND

On 1 November 2019, the Authority published an Information Memorandum (IM) aimed at outlining the Independent Communications Authority of South Africa's (Authority) intended approach with regards to the licensing process for International Mobile Telecommunications (IMT) spectrum pursuant to consideration of the Policy on High Demand Spectrum and Policy Direction on the Licensing of a Wireless Open Access Network dated 26 July 2019.

The Authority received fifty-three (53) written representations by the deadline of 31 January 2020. Four (4) additional written representations received after the deadline were not considered. The Authority did not hold public hearings since the Authority did not call for public hearings on the notice and the IM does not fall within the prescript of section 4 (6) of the Electronic Communications Act, 2005 (Act No.36 of 2005).

The Authority conducted a Competition Assessment and Fair Valuation of Spectrum having considered and analysed the written representations. Furthermore, the Authority had considered the Policy on High Demand Spectrum and Policy Direction on the Licensing of a Wireless Open Access Network (WOAN) published on 26 July 2019 in Government Gazette Number 42597 (the Policy).

This reasons document is intended to outline the reasons for the decisions of the Authority with respect to the written representations received and the work that the Authority has done towards finalising the Invitation to Apply (ITA). It covers the legislative and regulatory framework, the analysis on the IM, the policy considerations, the Competition Assessment and Fair Valuation of the Spectrum Bands – IMT700, IMT800, IMT2600, and IMT3500.



DR. KEABETSWE MODIMOENG
CHAIRPERSON
ICASA

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LEGISLATIVE AND REGULATORY FRAMEWORK

LEGISLATIVE AND REGULATORY FRAMEWORK

1.1 The ITA is guided by the Constitution of the Republic of South Africa, 1996 (the "Constitution"), the Independent Communications Authority of South Africa Act, 2000¹ (ICASA Act), the Electronic Communications Act, 2005² (ECA), the National Radio Frequency Plan 2018³ ("NRFP"), the Radio Frequency Spectrum Regulations, 2015⁴ and Radio Frequency Spectrum Assignment Plans (RFSAP) for IMT, 2015⁵, as well as the broader policy objectives of South Africa as set out in:

1.1.1 The National Integrated ICT White Paper, 2016 ("White Paper");

1.1.2 The National Development Plan;

1.1.3 South Africa Connect: Creating Opportunities, Ensuring Inclusion South Africa's Broadband Policy (SA Connect);

1.1.4 Broadcasting Digital Migration Policy 2008 (as amended);

1.1.5 Radio Frequency Spectrum Policy 2010; and

1.1.6 The Policy on High Demand Spectrum and Policy Direction on the Licensing of a Wireless Open Access Network dated 26 July 2019.

1.2 The Constitution

Section 192 of the Constitution stipulates that "National legislation must establish an independent authority to regulate broadcasting in the public interest, and to ensure fairness and a diversity of views broadly representing South African society" (own emphasis).

¹ Act No. 13 of 2000

² Act No. 36 of 2005

³ Government Gazette No. 41650 of 25 May 2020

⁴ Government Gazette No. 38641 (Notice No. 279) of 30 March 2015, as amended in Government Gazette No. 38754 (Notice No. 386) of 30 April 2015, No. 40436 (Notice No. 781) of 22 November 2016 and Government Gazette No. 42808 (Notice No. 585) of 30 October 2019

1.3 The ICASA Act

1.3.1 Section 2 of the ICASA Act stipulates that the object of the ICASA Act is to establish an independent authority which is to regulate broadcasting, electronic communications and postal matters in the public interest.

1.3.2 Section 4(3)(c) of the ICASA Act provides that the Authority must control, plan, administer and manage the use and licensing of the radio frequency spectrum in accordance with bilateral agreements or international treaties entered into by the Republic of South Africa.

1.4 The ECA

1.4.1 Section 30 (2) of the ECA mandates the Authority to control, plan, administer, manage, license and assign the use of radio frequency spectrum. In executing its mandate, the Authority must ensure compliance with applicable standards and requirements of the ITU's Radio Regulations, and the NRFP⁶.

1.4.2 Section 31 (2) of the ECA stipulates:

"(a) A radio frequency spectrum licence is required in addition to any service licence contemplated in Chapter 3, where the provision of such service entails the use of radio frequency spectrum.

(b) A service licence is required in addition to any radio frequency spectrum licence where the provision of such service entails the use of radio frequency spectrum."

⁵ Government Gazette No: 38640 of 30 March 2015, as amended in Government Gazette No. 38755 of 4 May 2015(Notices 387, 388,389,390,391, 392, 393 and 394 of 2015)

, and Government Gazette No. 43341 (Notice No. 285) of 22 May 2020

⁶ Section 30 (2) (a) of the ECA

1.4.3 Section 31 (3) (a) of the ECA mandates the Authority to develop regulations setting out the procedures and criteria for radio frequency spectrum licences in instances where there is insufficient spectrum available to accommodate demand.

1.5 The Radio Frequency Spectrum Regulations, 2015 (“the Regulations”)

1.5.1 Regulation 6 of the Regulations sets out instances where an extended application procedure for spectrum is required, which includes spectrum applied for through an ITA.

1.5.2 Regulation 7 (Procedure Where There is Insufficient Spectrum to Meet Demand or Where an ITA is Published) of the Regulations stipulates:

“(1) The Authority will at all times publish an ITA where a radio frequency spectrum licence will be awarded/granted on a competitive basis and where it determines that there is insufficient spectrum available to accommodate demand in terms of section 31(3)(a) of the Act...”

1.5.3 The Radio Frequency Spectrum Regulations, 2015, apply generally to all areas of radio frequency spectrum and to all types of Radiocommunications services.

1.5.4 The Radio Frequency Spectrum Regulations, 2015 established the framework through which the Authority may allocate and assign radio frequency spectrum under the NRFP.

1.5.5 The Radio Frequency Spectrum Regulations, 2015 also sets out the procedure and criteria for awarding spectrum licences in instances where there is insufficient spectrum available to accommodate demand.

1.5.6 The Radio Frequency Spectrum Regulations, 2015 seek to ensure transparent, fair and efficient procedures for the radio frequency spectrum licence applications and allow greater flexibility such that special conditions and procedures for specific frequency bands may be applied.

1.6 Radio Frequency Migration Regulations 2013 and Radio Frequency Migration Plan 2019

1.6.1 On 03 April 2013, the Authority published the Radio Frequency Migration Regulations and Radio Frequency Migration Plan Explanatory Document.

1.6.2 On 30 March 2015, the Authority published the Radio Frequency Spectrum Assignment Plans ("RFSAP") for IMT which sets out the technical conditions on the use of IMT Spectrum.

1.6.3 The Authority published the amendment of the Radio Frequency Spectrum Assignment Plan for the IMT2600 on 22 May 2020 in the Government Gazette 43341 (285 of 2020) to amend the channel arrangement to full Time Division Duplex (TDD) mode from the combination of TDD and Frequency Division Duplex (FDD) modes.

1.6.4 On 29 March 2019, the Authority published the Radio Frequency Spectrum Assignment Plan for the frequency band 825 to 830 MHz and 870 to 875 MHz, which Plan supersedes the Radio Frequency Migration Plan and explanatory document, and any previous assignment arrangements for the same spectrum allocation.

1.6.5 The Radio Frequency Migration Regulations and the Radio Frequency Spectrum Assignment Plan set out the regulatory procedure and process for the migration of use and users of Spectrum.

1.7 **IMT Roadmap**

1.7.1 On 14 November 2014, the Authority published the final International Mobile Telecommunications (IMT) Roadmap 2014. The IMT Roadmap was updated on 29 March 2019 and the updated version is available on the ICASA Website.⁷

⁷ See: <https://www.icasa.org.za/legislation-and-regulations/final-international-mobile-telecommunications-roadmap-2019>

1.8 Terrestrial Broadcasting Frequency Plan

- 1.8.1 Terrestrial Broadcasting Frequency Plan, 2013, as amended, was published for the purposes of adding details to the assignment/allotment of broadcasting frequencies, with specific emphasis on the frequencies that will be assigned for Digital Terrestrial Television.
- 1.8.2 The Authority recognized that the Analogue Television Broadcasting Services would have been migrated by 17 June 2015 in conformance to the International Telecommunication Union (ITU) Radio Regulations.
- 1.8.3 Prior to the analogue switch-off deadline of the ITU, the Authority developed the Terrestrial Broadcasting Frequency Plan (TBFP) to facilitate the deployment of Digital Terrestrial Television (DTT) services in South Africa.
- 1.8.4 The Digital Terrestrial Network is being rolled out nationally by Signal Distributors, coordinated by the Project Management Office of the Department of Communications and Digital Technologies, in accordance with the published plan in Annexure G of the TBFP.
- 1.8.5 In rolling out the network, there had to be mitigation techniques applied to ensure that existing analogue services co-exist with the design of Digital Terrestrial Television (DTT) Multiplex thus resulting in Digital Services being catered above 694 MHz as indicated in Annexure G of the TBFP.
- 1.8.6 Furthermore, the final DTT Single Frequency Plan in Annexure J of the TBFP, had to be coordinated with the South Africa's Six (6) neighboring Countries in line with the Geneva 2006 Agreement (GE-06).
- 1.8.7 The Coordinated plan had to be notified to the International Telecommunications Union's Radiocommunications (ITU-R) Master Frequency International Register (MFIR) in compliance with the GE-06.

- 1.8.8 The plan has successfully met conformance requirements set out in the GE-06 agreement.
- 1.8.9 The Authority developed the Radio Frequency Spectrum Assignment Plans for IM700 and IMT800, in consultation with the public, with the understanding that the analogue switch-off will be concluded by 01 January 2016 and 01 July 2015, respectively.
- 1.8.10 The Authority developed the Radio Frequency Spectrum Assignment Plan for DTT in an effort to expedite the Analogue Switch-Off. The obligations set for IMT700 and IMT800 are to be synchronized with the Analogue Switch-Off.
- 1.8.11 The date for the final switch-off of the analogue signal will similarly be announced by the Minister of Communications and Digital Technologies. This will be the final step in clearing the frequency bands 703 – 790 MHz and 790 – 862 MHz. The Authority published the Radio Frequency Spectrum Assignment Plan for the band 470 to 694 MHz on 22 May 2020 in Government Gazette No. 43341 (Notice 284 of 2020) to expedite the digital migration programme.

1.9 Ministerial Policies and Policy Directions

1.9.1 In terms of section 3(4) of the ECA:

“the Authority ... in exercising its powers or performing its duties in terms of this Act and the related legislation must consider policies made by the Minister in terms of subsection (1) and policy directions issued by the Minister in terms of subsection (2).”

- 1.9.2 In accordance with the Policy on High Demand Spectrum and Policy Direction of the Licensing of Wireless Open Access Network, the Minister directed the Authority to consider the assignment of High Demand Spectrum to the WOAN and the remaining High Demand Spectrum to electronic communications network service licensees.

INFORMATION MEMORANDUM REPRESENTATIONS⁸

⁸ The discussions in this section are set out in accordance with the format of the IM.

OBJECTIVES

1. **Competition Commission South Africa (CCSA)** in its submission has argued that some of the sub-objectives could work against each other or against the stated primary objective. For instance, prioritizing universal coverage or quality aspects (such as speed) will have implications for costs and therefore price and affordability, and thus targeting one objective exclusively may only be at the expense of the other. **CCSA** pointed out that the Authority should provide greater focus to the Market Context and affordability in the licensing of the spectrum.

The Authority's response:

The Authority is of a similar view that it may not practically be possible to have all the objects of the ECA, as outlined in the IM, achieved. For example, a bidder may outbid its competitors on one of the valuable radio frequency spectrum bands, however the objective for universal service may allow the bidder to entrench its dominance in a market. To this end, the Authority believes the following objectives of the ECA must be prioritised:

- **Promotion of broad-based black economic empowerment, with particular attention to the needs of women, opportunities for youth and persons with disabilities;**
- **Promotion of the universal provision of electronic communications networks and electronic communications services and connectivity for all;**
- **Promotion of the interests of consumers with regard to the price, quality and variety of electronic communications services;**
- **Develop and promote of SMMEs and cooperatives;**
- **Encourage investment and innovation in the communications sector;**
- **Promote an environment of open, fair and non-discriminatory access to broadcasting services, electronic communication networks and to electronic communications services;**
- **Promote competition within the ICT sector;**
- **Promote and facilitate the development of interoperable and interconnected electronic networks, the provision of the services**

contemplated in the Act and to create a technologically neutral licencing framework; and

- **Ensure efficient use of the radio frequency spectrum.**

2. **Rain** in its submission pointed out that since its establishment it has strived to ensure that Government and ICASA's objectives of universal access, inclusive participation by all societal groups, innovation and affordability in the Information and Digital Communications Sector are realized.
3. **MTN** and **Community Investment Venture Holdings (CIVH)** support the Authority's stated public policy objectives. **MTN** further indicated that set objectives are shaped by the New Growth Path and Strategic Integrated Project which prioritise rural and under-serviced areas in order to stimulate economic growth.
4. **CIVH** is in support of all the national objectives articulated in the Information Memorandum (IM). **CIVH** further argued that although the Minister abandoned the ECA amendment process, the Minister and operators made certain commitments including an offtake of up to 30% of capacity from the WOAN during the course of its life.
5. **Vodacom** is in support of the Authority's objective to ensure nationwide broadband access for all citizens by 2030.
6. **Telkom** highlighted, in its submission, the sections of the ECA related to the IMT Licensing Process and the relevant Case Law and in particular cited the Vodacom and Neotel merger. **Telkom** in its conclusion states: "Authority has a duty to promote competition when undertaking its regulatory activities including when licensing spectrum. The process outlined in the IM fails to fulfil this duty."

The Authority's response:

The Authority has conducted the Competition Assessment as part of this licensing process. The Competition Assessment aims to assess the state of Competition in the ICT Sector and how the licensing of IMT Spectrum is

going to impact the competition landscape of the sector. Furthermore, the Competition Assessment informs how the spectrum Lots, spectrum floors, spectrum caps should be arranged in order to promote competition. The ITA clearly indicated how the Authority intends to promote competition.

LEGAL FRAMEWORK

7. **Telkom** draws the Authority's attention to the following Policies: The 2012 NDP, SA Connect, the 2016 Integrated ICT Policy, and the 2019 Ministerial Policy and Policy Direction. From these above-mentioned policies, **Telkom** conclude that the Authority should regulate competition effectively in the ICT Sector.
8. **Telkom** further states that Universal Access is vital, but that there is currently under-provision of broadband services. **Telkom** highlighted the contrasts between the 2016 Integrated ICT Policy and the 2019 Ministerial Policy and Policy Direction with regards to the IMT bands to be licensed. They further state that the Authority must consider the assignment of spectrum in the 700 MHz, 800 MHz and 2600 MHz frequency bands to ensure preferential treatment for the WOAN.
9. **Telkom** is concerned about the imbalances of the spectrum below 1GHz, since not all the Mobile Network Operators have spectrum below 1GHz.
10. Similarly, **Cell C** is concerned that the decision to include IMT2300 and IMT3500 could be subject to challenge without further explanation. However, **Cell C** further notes that it is beneficial to the WOAN to have access to these bands as it could improve its competitive position.

The Authority's response:

The Authority initially considered to set aside radio frequency spectrum with different configurations in the information memorandum on the spectrum bands: IMT700, IMT800, IMT2600.

After due consideration, the Authority decided to set aside spectrum (IMT700: 2x10 MHz; IMT2600: 1x30 MHz; IMT3500: 1x30 MHz) for the WOAN to partake in the market as a credible wholesale player.

11. **Cell C** is of the view that Notice of the Information Memorandum should have been named: Invitation to Apply (ITA). The importance of following all the legislative and regulatory requirements in publishing the ITA cannot be overstated.

The Authority's response:

The Authority issued a notice to initiate the Licencing process of International Mobile Telecommunication (IMT) Spectrum through an Information Memorandum (IM) aiming to provide guidance to prospective applicants on the process and criteria to be applied on the licensing process in terms of regulations 6 and 7 of the Regulations⁹, read with sections 31 (3), and 33 of the ECA¹⁰. The purpose of the IM was NOT TO INVITE APPLICATIONS, but rather to request the public to comments on the proposed process and criteria for licensing of IMT Spectrum as outlined in the contents of the IM.

12. **Vodacom** insists that before the Authority imposes some obligations that are recommended in chapter 10 of the ECA, they must follow the chapter 10 process. Imposing roaming and facilities leasing at cost prices as an obligation can only be done following the chapter 10 process.
13. **Rain** further recommends that Mobile Network Operators co-build and share rural infrastructure. **Rain** further states that regulatory intervention is required to ensure access to infrastructure is provided to the smaller operators. In addition to that proposal, **Cell C** proposes that the Authority should provide oversight on facilities leasing to allow access for the disadvantaged MNOs and the Authority to prescribe essential facilities and mandate access.
14. **CIVH** seeks clarity in relation to the requirement that MNOs provide cost-oriented roaming services to the WOAN with seamless handover for a 5-year period. **CIVH**

⁹ Radio Frequency Spectrum Regulations, 2015

¹⁰ Electronic Communications Act, 2005 (Act No. 36 of 2005)

15. **SMILE** argues that for the WOAN to be commercially viable certain regulatory advantages should be provided for access to mandatory roaming services from operators for a period of 10 years.

The Authority's response:

Facilities leasing issues are regulated in terms of the Facilities Leasing Regulations¹¹. National roaming is regarded as a commercial arrangement amongst operators and is currently not regulated by the Authority.

16. **Vodacom** needs clarity on the Authority's understanding of Reg 7 (3) (d) of the Radio Frequency Spectrum Regulations, 2015 as amended. **Vodacom** understands this regulation as "either/or" not "this and that"; for example you will be disqualified if you have less than 30% Historically Disadvantaged Persons (HDP) Ownership OR you are a below level 4 Broad-Based Black Economic Empowerment (BBBEE) contributor, as opposed to 30% ownership AND level 4 contributor as suggested by the Authority.

The Authority's response:

Regulation 7 (3) (d) of the Radio Frequency Spectrum Regulations, 2015 as amended, disqualifies an applicant who has less than 30% HDP ownership OR is below a level 4 BBBEE contributor¹².

17. **Liquid Telecom (LT)** argues that the IM has been published with an unclear policy landscape with multiple proposals for significant change having been made in the last 5 years, but not taken to completion. **LT** notes with concern that the IM lacks specificity, given the urgency and importance of finalising the framework to license spectrum to achieve policy goals for sustainability of the sector.

The Authority's response:

¹¹ Government Gazette No. 33252 (Notice No. 9295 of 31 May 2010)

¹² Below level 4 is level 5, 6, and so on

Concerns raised by LT are noted. The ITA has outlined all the Policies that are related to this licensing process and has thus addressed concerns about the unclear policy landscape indicated by LT.

18. **Telkom** is concerned about the inclusion of the spectrum bands that should not be included in the auction.
19. **Telkom** is looking for impact assessment of current spectrum holdings.

The Authority's response:

The Authority has noted the spectrum bands included on the Policy. During the development of the Information Memorandum with consideration to Policy, the Authority had decided to include the spectrum bands IMT2300 and IMT3500 for consultation. The reason being that these two spectrum bands are already identified bands for IMT by the ITU. Furthermore, the Radio Frequency Spectrum Assignment Plans for these spectrum bands are in place and effective which makes the bands ready to be licensed.

However, the Authority has resolved that the IMT2300 band will be licensed in future, taking into consideration the feasibility study to be conducted in accordance with the Radio Frequency Spectrum Assignment Plan for the frequency band IMT2300 published in the Government Gazette Number 38755 (Notice 392 of 2015).

The Authority is aware that a Regulatory Impact Assessment (RIA)/Socio Economic Impact Assessment System (SEIAS) is a recommended best practice for before introducing regulatory interventions. However, the Authority is also aware that a RIA/SEIAS is not a peremptory regulatory requirement and is of the view that it has carried out sufficient analysis and research through obtaining submissions on the IM and conducting a competition assessment.

PROPOSED SPECTRUM FOR THE AWARD

20. **City of Cape Town** is requesting the Authority to allocate specific portions of the spectrum for providing Public Protection and Disaster Response related communications in line with ITU guidelines for IMT and South Africa's National Radio Frequency Plan. The recommended frequencies are: IMT600-700 or IMT700-800 to deploy LTE for a Public Safety Network.
21. **Altron** further noted that Option 4 contains an additional 2 x 10MHz (FDD) (723-733MHz & 778-788MHz) for 'Future Assignment'. Government, including Public Protection and Disaster Relief (PPDR), safety, security and all service delivery obligations have a need for secure broadband communications, especially in 'hot spot' areas i.e. Gauteng Province, major metropolitan areas and any National Key Point. It is recommended that this unassigned allocation be reserved for this purpose. 10 MHz (TDD) on IMT2600 should be secured and assigned for the PPDR services.
22. Similarly, **Motorola** is proposing that PPDR systems be assigned 2x 10 MHz on IMT700 (703 - 713 MHz//758 - 768 MHz). It is noting CRASA's "Framework for Harmonisation of Radio Frequencies for Public Protection and Disaster Relief (PPDR)", updated in April 2019, wherein members agreed to recommend that part of the frequency paired arrangement of 700MHz within the 2x33 MHz be harmonized for Broadband PPDR, based on ETSI LTE standard and in accordance with ITU R Resolution 646 (WRC-2015) and Recommendation ITU-R M. 2015. **Motorola** further adds that CRASA has recommended that its members amend their national frequency plans to incorporate PPDR spectrum decisions, strengthen the regional policy harmonisation.
23. Furthermore, the **Department of Public Service and Administration (DPSA)** propose that a portion of the available spectrum must be reserved for Security Cluster to ensure secure communication amongst the cluster members.

The Authority's response:

The Authority acknowledges the requirement for PPDR Spectrum. The Authority is in the process of updating the National Radio Frequency Plan,

2018 wherein consideration for the spectrum assignment under typical application for PPDR services will be done. Furthermore, the requirements for the security services are coordinated with the Ministry of Communications and Digital Technologies in consultation with the Ministries responsible for Security Services.

The Authority's response:

The Authority acknowledges the concerns by Denel. However, the Radio Frequency Spectrum Assignment Plans, 2015 have been consulted with the public and all stakeholders. As stated above, the Authority has resolved not to license the IMT2300 band in this licensing process. The feasibility study on the IMT2300 band will be conducted to migrate Fixed Services out of the band and the radio frequency spectrum licences that do not conform to the IMT services will be amended accordingly.

- 25. FCC Projects and Services, Sun and Shield, Unique Net, Day Dreamer and ICT Projects, Bowline Safeguarding, Go-Bee, AABA, Juicy Telecoms, TUSE APPLICATION, and ICT SMME Chamber** urge the Authority to assign all the spectrum to be licensed to the WOAN. All other spectrum available must be availed to the WOAN first before it be assigned to other players.
- 26. Go-Bee, AABA and Juicy Telecoms** further add that the MNO can procure spectrum from the WOAN and that there is need for equitable treatment of licensees with respect to the amount of low, mid and high band spectrum.

27. However, on the proposed Lots, **Vodacom** recommends that the WOAN be assigned 2x15 MHz instead of 2x10 or 2x5 MHz on the sub 1-GHz spectrum.
28. **Telkom** notes that the IM proposes that the WOAN receive 40-65 MHz of 2.6 GHz along with sub-1 GHz spectrum. **Telkom** considers that this is insufficient to ensure that the WOAN is financially viable.
29. **ICT SMME Chamber** adds that the proposed five options disadvantage the WOAN's ability to be a wholesaler that will, at all times, be able to deliver quality services to its customers, since the spectrum will not be enough. Does ICASA accept that, inadvertently, its proposed five options all bear "a sting in the tail" for the WOAN? If so, what measures does ICASA plan to put in place to avoid rendering the WOAN a stillborn?
30. **MzansiWoan** strongly supports the proposed spectrum for the WOAN on Option 1 or 5.

The Authority's response:

It is important to set-aside spectrum to be licensed to the WOAN that will enable it to be a credible national wholesale operator in the market. However, awarding the entire spectrum identified in this process to the WOAN will go against all the other objectives that are set in the ITA, and it will result in an anti-competitive environment by promoting a monopoly, for example providing services to the under serviced areas.

31. **Intel Corporation** is in support of the Authority to license IMT700 and IMT800 and the IMT2600 bands and the intent of the Authority to license 1x 116 MHz in the 3500 MHz band (3 428 – 3 544 MHz).
32. It further suggests that the Authority should consider auctioning the entire 3300 – 3600 MHz band with 80 to 100 MHz of contiguous blocks per operator. The actual size of the assigned blocks should be determined by the auction procedure itself, with the channel raster based on 10 MHz lots.

33. **CIVH** recommends that the remaining 120MHz in the 3600 - 3800MHz band (5G band n77 (3300 – 4200MHz)) be made available to the WOAN with any remaining portions to industry; since ICASA has already allocated 3600 – 3680MHz to an incumbent (Rain). Further, agreeing with ICASA's notice of 600 of 2019 with regards to the Final International Mobile Telecommunication (IMT) Roadmap 2019¹³.

The Authority's response:

The 3600 – 3800 MHz band was not considered for licensing since the band is currently not identified as an IMT band in South Africa.

34. **WAPA** recognises the financial and administrative appeal of including IMT2300 and IMT3500 allocations in the upcoming licensing process but notes the Minister's directive to the Authority to engage in an investigation of the spectrum requirements of 5G in bands lower than 6GHz which report is yet to be finalised.
35. **SACF** is in support of the inclusion of IMT3500 as it has already been licensed, with LOTs packaged with 20MHz as opposed to 10 MHz for meaningful rollout's sake.
36. **Telkom** opposes the current consideration of licensing IMT3500. The current planned assignment of 116 MHz of spectrum in the 3.5 GHz will not be sufficient for operators to obtain the 80-100 MHz of spectrum that is likely to be necessary to offer full enhanced mobile broadband ("eMBB") services that fully capitalise on the capabilities of 5G for more than one or two operators.
37. **CIVH** supports the inclusion of the 2300 and 3500MHz bands in the IM, including these bands in the IM and making them available at the same time as other high demand spectrum is likely to lead to positive outcomes seen elsewhere from the award of this spectrum.

¹³ page 179 stating that "Unpaired TDD bands can be made available more easily than paired bands. High performing mobile networks require wide channel bandwidths of say 60-70 MHz or 100 MHz."

The Authority's response:

The IMT2300 and IMT3500 are already identified bands for IMT by the International Telecommunication Union (ITU). The Radio Frequency Spectrum Assignment Plans for these are in place which make the bands ready to be licensed. The investigation for IMT2020 spectrum requirements as required in terms of the Minister's Policy Direction is in respect of the bands that were on the World Radiocommunication Conference, 2019 (WRC-19) Agenda.

38. **SARAO** requests the Authority not to authorise the use of spectrum for IMT700, IMT800, IMT 2300, IMT2600 and IMT 3500 because the notice of the radio frequency spectrum exempted for use within the KCAAs in Government Gazette No. 42531 of 14 June 2019, authorised the identical spectrum for IMT900. SARAO urges the Authority to indicate that there are currently prohibitions and restrictions on the use of this spectrum in the KCAAA and the use of some or all the proposed spectrum may not be available in the area.

The Authority's response:

The Authority has indicated the prohibitions and restrictions on the use of the spectrum in the Karoo Central Astronomy Advantage Areas (KCAAA) area in the ITA in accordance with Astronomy Geographic Advantage Act, 2007 (Act No. 21 of 2007) and Notice of the radio frequency spectrum exempted for use within the KCAAA published in Government Gazette Number 42531 (Notice 926 of 2019).

39. **Rain** submitted that Option 1 of the LOTs is unattractive with a wastage of 5MHz.

The Authority's response:

It is the Authority's view that the IMT800 Radio Frequency Spectrum Assignment Plan has been aligned to have the entire 2x30MHz available to be assigned thus ensuring that the entire IMT800 frequency band is used efficiently.

40. **Rain** proposes that the free spectrum in option 2 and 4 be auctioned with the rest of the spectrum.

The Authority's response:

The Authority is of the view that it is best to auction all the considered spectrum on the Information Memorandum excluding the spectrum that is set-aside for the WOAN, in order to meet the objectives of this licensing process¹⁴.

41. **Rain, Vodacom, MTN, Liquid Telecom (LT) and Telkom** are in support for the IMT2600 band to be used as TDD. **MTN** recommends that ICASA adopts a TDD approach to spectrum in the 2600 MHz range in line with the current ICASA roadmap (GG42829).
42. **SACF** adds that FDD remains the prevailing standard for IMT 700 and IMT 800, while TDD remains the prevailing standard for IMT 2300, IMT2600 and IMT3500.

The Authority's response:

The RFSAP for IMT2600 has been amended to be utilised in the TDD mode as a channel arrangement for the band. The amended channel arrangement of the IMT2600 spectrum band to TDD mode is evident in the ITA.

43. However, **Rain** does not support in-band migration due to financial commitment it already made on equipment for band 38 in relation more than 1000 sites it has already deployed. **Rain** needs financial compensation for the in-band migration (2570MHz-2590MHz to 2540MHz-2560MHz) suggested in option 2 which will cost millions of rands. **Rain** is requesting to be left where it is (2575 - 2595MHz), it says the WOAN must instead synchronise its network with Rain's because taking Option 1 (2570-2590) will mean that Rain will interfere with Lot E.

¹⁴ Objectives as outlined page 14 of this reasons document.

The Authority's response:

It is the Authority's view that the amended Radio Frequency Spectrum Assignment Plan for IMT2600 is in place which assigns 20 MHz to Rain and currently no in-band migration is envisaged.

44. **Rain, CCSA, Telkom** are not in support of the bundled spectrum bands, splitting the higher frequencies from the lower frequencies to create smaller lots specific to each frequency band.

The Authority's response:

The Authority has decided to unbundle the spectrum bands for licensing to allow for flexibility for the Market/Industry to determine its own spectrum requirements.

45. **Qualcomm** is in support of Option 5 of the LOTs as it is more practical. It further proposes that the award of spectrum in the IMT2300 and IMT3500 bands be either on a regional or national basis. **Qualcomm** encourages ICASA to make at least some portion of the spectrum available on a nationwide basis. In doing so, ICASA would make such bands attractive to stakeholders who seek to deploy or supplement nationwide networks for the provision of IMT services and have business plans to do so. Making spectrum available solely on a regional basis would complicate the process for a nationwide operator to obtain spectrum, potentially making investment in a South African network less attractive.
46. **The CCSA** is in agreement with the IM that some of the frequency bands can be auctioned on a regional basis rather than a national basis. However, MTN propose that IMT2300 and IMT3500 band spectrum be awarded on a national basis.
47. **WAPA** adds that should the Authority elect to proceed with the assignment of these bands in the current licensing process, WAPA would request that the Authority's ITA be structured in a manner that favours licensing on a regional basis to accommodate SMME licensees.

48. **R2K** submit that all spectrum should be awarded at the national level, prices in spectrum lots should be similar to allow for a general practice of fairness, and there should be certainty over prices paid and a preference for uniform prices if spectrum blocks are similar.

The Authority's response:

The national award of spectrum is recommended as the most efficient way of assigning spectrum and will be cost effective to the licensees in terms of spectrum fees. The regional award requires the country to be geographically sub-divided, in a matrix configuration, using polygons. This approach would require a lengthy consultative process. Furthermore, spectrum sharing is permitted in the Regulations.¹⁵

49. **MzansiWoan** indicated that IMT2300 and IMT3500 LOT tables don't make any spectrum allocation (considerations or guarantees) for the WOAN in the IMT2300 and IMT3500 bands and it inquired from ICASA why the WOAN is not being considered for allocation on these frequency spectrum bands.

The Authority's response:

It is important to set-aside spectrum to the WOAN that will ensure it performs as a credible fifth national wholesale player in the market. The Authority has set aside spectrum for the WOAN in the IMT700, IMT2600, and IMT3500 spectrum bands which is more than what is assigned to the current Mobile Network Operators.

50. **Cell C** argues that rationale was not provided as to why IMT2300 and IMT3500 bands are included on the IM and whether they are auctioned as part of the packaged LOTs. **Cell C** further suggests that the WOAN be accommodated on these bands to increase its business viability.
51. **The Internet Service Provider's Association (ISPA)** adds that the Authority's initiative to include IMT2300 and IMT3500 may be premature. Most importantly,

¹⁵ Radio frequency Spectrum Regulations, 2015

the inclusion of these bands at this time will complicate a process that needs to be kept as simple as possible.

52. **Telkom** proposes that all the proposed bands in the IM be excluded from the licensing process except IMT2600.
53. **Vodacom** supports the inclusion of 2300MHz and 3500MHz spectrum. **Vodacom** suggests that WOAN be given 2x 15MHz in the IMT800 because of advanced equipment ecosystem.
54. **Cell C** proposes that spectrum should be assigned equitably (with an exception to the WOAN). The WOAN should be assigned sufficient spectrum for it to be viable in the skewed market. **Cell C** is in support that the WOAN should be assigned spectrum as indicated on Option 1 of the IM. However, IMT2600 should be assigned in TDD mode. **Cell C** proposes the Lots as follows:

54.1 LOT A (WOAN): 2x10 MHz on IMT700; 2x30 MHz on IMT800, and 1x 90MHz on IMT2600.

FOR INDUSTRY AUCTION:

- 54.2 LOT B: 2x10 MHz on IMT700 and 20MHz on IMT2600
- 54.3 LOT C: 1x 20 MHz on IMT2600
- 54.4 LOT D: 2x10 MHz on IMT700 and 20MHz on IMT2600
- 54.5 LOT E: 20 MHz on IMT2600

55. **Cell C** further proposes that the spectrum for IMT2300 should be assigned to the WOAN. **Cell C** further adds that if the Authority is to licence IMT3500 it should do so fairly to all the market players.
56. **The CCSA** recommended in the Data Service Market Inquiry (DSMI) report that the spectrum assignment process explicitly take account of competition concerns in the market through asymmetric assignments that do not favour the players with market power.
57. The **CCSA** argues that the Lots designed in the IM suit larger operators with national networks. The combination of low-frequency (coverage) spectrum with

higher-frequency spectrum is most suited to an operator with a large footprint beyond the urban areas as well as voice services in addition to data services.

58. The **CCSA** further recommends that if the WOAN licensing process is likely to take longer than the spectrum assignment process for other bidders, then it may be appropriate to assign to the WOAN spectrum that may be delayed due to the digital migration process.
59. **MTN** recommends Option 2 with the re-arrangement of Lot D to lie alongside Rain's existing spectrum and the inclusion of a Lot E comprising of 2 x 10 MHz of 800 MHz spectrum.
60. **SMILE** adds that to ensure that the WOAN is able to deliver optimal data outcomes and ensure the realisation of the SA connect goal of 10Mbps for all South Africans, the WOAN would require a minimum of:
- 2 x 25 MHz FDD in the 800MHz band,
 - 1 x 60 MHz (TDD) in the 2600MHz band; and
 - 100MHz in the IMT3500 band should be assigned to the WOAN and operators seeking to deploy technologies that are compatible with this band should procure that capacity from the WOAN. **SMILE** concurs with CSIR's recommendation that a spectral efficiency study should be conducted at five-year intervals to assess the WOAN's spectrum needs.
61. **Telkom** submits that the Authority should assign 20 MHz of SUB-1 GHz Spectrum and 90 MHz of 2.6 GHz Spectrum to the WOAN. **Telkom** is therefore of the view that only 2x10 MHz of sub-1 GHz spectrum should be assigned to the WOAN. 110 MHz is not unreasonable bandwidth for the WOAN.
62. **SAIEE** argues that there is enough IMT spectrum available for assignment to allow up to 11 national packages, plus an additional 50 regional packages. **SAIEE** adds that not all available IMT spectrum has been considered, such as the "guard bands" in the 700 and 800 MHz bands.
63. It should be noted, adds **WAPA**, that spectrum combinations proposed by the CSIR's report were stated as the minimum required for viability of the WOAN given

initial assumptions and the terms of reference of the study. **WAPA** supports the use of an unaltered or otherwise expanded Option 1 in the upcoming invitation to apply ("ITA") and auction process.

64. **CIVH** notes that the Minister's policy direction does require that the WOAN be "preferred" in the determination of Lots including each of the 700, 800 and 2600 MHz bands but this does not appear clearly in the IM. Further, sub-1 GHz supports widespread coverage across urban, suburban and rural areas and help support Internet of Things (IoT) services. 1-6 GHz offers a good mixture of coverage and capacity benefits. This includes 1800 MHz, 2.1 GHz, 2.3 GHz, 2.6 GHz and spectrum within the 3.3-3.8 GHz range which is expected to form the basis of many initial 5G services. Above 6 GHz is needed to meet the ultra-high broadband speeds and ultra-low latency envisioned by 5G.
65. **CIVH** is of the view that allocating small segments of spectrum across multiple bands simply increases deployment costs and leads to higher cost of service delivery and pricing to consumers; as such they do not advocate for the allocation of both IMT700 and IMT800 to the WOAN as shown. A single significant tranche of bandwidth as per Option 2, 3, or 4 is preferable.

The Authority's response:

The IMT2300 and IMT3500 spectrum bands are already identified bands for IMT by the ITU. The Radio Frequency Spectrum Assignment Plans for these spectrum bands are in place and effective which makes the bands ready to be licensed. However, the Authority has resolved that the IMT2300 band will be licensed in future, taking into consideration the feasibility study to be conducted in accordance with the Radio Frequency Spectrum Assignment Plan published in the Government Gazette Number 38755 (Notice 392 of 2015). The Authority has set aside spectrum for the WOAN on the IMT700, IMT2600, IMT3500 (IMT700: 2x10 MHz; IMT2600: 1x30 MHz; IMT3500: 1x30 MHz) which is more than what the current Mobile Network Operators are assigned to ensure its viability. All the spectrum is unbundled, and the other spectrum will be licensed to the industry in accordance with Radio Frequency Spectrum Regulations, 2015 (as amended).

66. **Altron and Dominion Business Investment (DBI)** consider Option 4 as the most appropriate. The WOAN will benefit from the matured ecosystem.
67. **Altron** further adds that the single block allocation in IMT700 for the WOAN enables the most cost-effective deployment for rural locations. This is based not only on the extended coverage that it would provide but also premised on a simplified and more efficient antenna configuration, reducing both cost and time to deploy. However, **EC Internet** suggest that WOAN should be accommodated on IMT800.

The Authority's response:

Licensing the WOAN in the IMT700 has a potential to afford the WOAN first mover advantage in that the WOAN will benefit from the early deployment of IMT2020 systems.

68. **R2K** submits that there should be a serious attempt at giving smaller networks an opportunity to access IMT2300 and IMT3500. This will aid in limiting profiteering and further monopoly by the larger networks.

The Authority's response:

The Auction aims to attract all I-ECNS Licensees to compete for the spectrum fairly in accordance with regulations 6 and 7 of the Regulations¹⁶.

69. Spectrum caps are recommended by the **CCSA** to prevent negative consequences on competition wherein dominance is entrenched.
70. **MTN** propose the following regarding spectrum caps:
- 70.1 cap of 10MHz be applied to auction spectrum below 1 GHz;
- 70.2 It is proposed that a cap of 155MHz be applied to industry spectrum between 1 GHz and 3 GHz;

¹⁶ Radio frequency Spectrum Regulations, 2015

- 70.3 A soft cap of 80MHz be applied to industry spectrum between 3 GHz and 6 GHz.
71. Whereas, **Telkom** recommends that there should be separate caps on Sub-1GHz and IMT2600 Spectrum and proposes that IMT2600 Spectrum be capped at 40 MHz.
72. **Cell C** submits that the Licensee with spectrum holdings in band considered for licensing should be precluded from Auction of that band.
73. **R2K** submits that spectrum caps are important in avoiding the maintenance of the status quo, giving already the influential and big networks further access to spectrum. This will allow smaller players and entrants to partake in the Auction. This balance is very important in the ultimate access to internet services of South African consumers especially the poor as a South African survey by the Competition Commission on data costs of has already shown major networks have too much monopoly over the telecommunications industry. According to the survey, the major networks are overpricing poorer consumers with an 'anti-poor pricing structure'.
74. **Telkom** submits that there is no proposal to redress the current unequal distribution of sub-1 GHz spectrum by the Authority. Access to sub-1 GHz spectrum is vital in providing mobile broadband services, in particular in rural areas. Currently four operators have access to sub-1 GHz spectrum. The Authority must also consider the future availability of 2 x 5 MHz in the 900 MHz band following the proposed in band migration. The IM does not address how to rebalance the holdings of sub-1 GHz spectrum in the Auction.

The Authority's response:

The spectrum caps should be applicable across the bands to be licensed to allow flexibility to I-ECNS Licensees in the Auction and to also ensure that I-ECNS Licensees have sufficient spectrum to compete fairly in the market. The radio frequency spectrum cap on the sub 1 GHz radio frequency bands of 2 x 21 MHz and an overall spectrum cap of 184 MHz has been implemented to ensure equitable access to spectrum by all players, strike an appropriate balance for competition in the market and

to ensure that the spectrum is not assigned to one entity. The ultimate objective being to ensure a market structure that can sustain at least five credible national wholesale players post the Auction.

75. **Vodacom** advocates for a discounted reserve price for coverage obligation in support of the deployment in rural areas.

The Authority's response:

The setting of the Reserve Prices takes into consideration the intended licence obligations as set out in the ITA.

76. **MTN** requests that the Authority clarifies how any delay in the availability of spectrum (IMT700 and IMT800) will be addressed in terms of licence expiry, the price of spectrum, compensation for delay and the timing of coverage obligations.
77. **South African Communication Forum (SACF)** further adds that Department and ICASA are encouraged to be in discussions with licensees in reaching solutions that will make the spectrum available (IMT700 and IMT800) as soon as is possible. Each of these bands are coverage bands; the conclusion of Digital Migration has a critical impact on the timeframes for the rollout, and specifically impacts the WOAN.
78. Whereas **Telkom** indicates that there is no clear plan on the migration process to avail IMT700 and IMT800 bands. **Telkom** suggests that this spectrum should not be licensed. Telkom further notes that this might affect competition in the market as the competing small players do not have access to sub-1 GHz spectrum but are required to compete with those who have spectrum on sub-1 GHz spectrum.
79. **MTN** is proposing that the licence term be 20 years and other licences should be aligned to ensure they align with the duration of the spectrum licence.
80. The **SABC** proposes that the process of licencing the 700MHz and 800MHz frequency bands can begin and be finalised. However, the bringing into use of the spectrum should only be done after the successful migration of the **SABC** as part of the Broadcasting Digital Migration (BDM) process. If these bands are licensed

and brought into use before the successful completion of the BDM process, it will result in an uncontrollable interference that will have serious and prejudicial financial impact on the Corporation.

81. **LT** notes that the timelines for the auction are not clear considering the delayed DTT migration. They note that the investment case for the 700 MHz and 800 MHz bands is severely impaired without clarity. It contends that this will result in low bids and lack of funding and proposes that bidders should only make payment once spectrum is usable. It proposes for the timing and sequencing of various complementary process i.e. licensing of the WOAN and DTT migration.

The Authority's response:

The Authority extended the licence period of the Radio Frequency Spectrum Licence (RFSL) from fifteen (15) years, as it was stipulated in the IM, to twenty (20) years, in order to effectively facilitate the availability of the spectrum in IMT700 and IMT800 bands which are subject to the digital migration process underway. To this end, licensees may apply to the Authority in accordance with Section 11 of ECA should they seek to align the period of the service licence to that of the radio frequency spectrum licence. Conversely, licensees can also opt for the service licence renewal process in line with the applicable legislative prescripts.

82. **LT** states its was assigned 2x4.92 MHz non-contiguous spectrum in the 850 MHz band and is now required to migrate within the band. However, it argues that no provision has been made for migrating out of 850MHz to suitable spectrum. **LT** is of the view that it is entitled to the spectrum in the 800 MHz equivalent to their current spectrum band post migration. It argues that reserving 850 MHz band for LTE removes the innovation opportunity in Region 1 for licence exempt low output wide area networks. According to it, the main concern is that the IM is entirely unclear as to how **LT's** rights as a licence holder will be affected. **LT** is concerned that it is expected to partake in the auction and pay for spectrum that is already assigned to it. It urges the Authority to consider this issue in its planning and engage them accordingly to find amicable solution.

83. **FCC Projects and Services, Sun and Shield, Unique Net, Day Dreamer, Bowline Safeguarding, Go-Bee, Juice Telecom, Tuse Application and EC Internet** ask as to what happened to **Liquid Telecom** spectrum in the IMT800 and whether is part of the Auction.

The Authority's response:

The Radio Frequency Spectrum Assignment Plan for the Band 825 to 830 MHz paired with 870 to 875 MHz calls for the LT's assignment to be shifted within the band and provides that LT must cease to operate using CDMA system in the long term.

84. In the IMT3500, **LT** notes that this band is critical for 5G with channel sizes from 50 to 100 MHz. **LT** proposes 50 to 100 MHz per network for high capacity and low latency. **LT** further proposes to the Authority to round up its assignment of 56 MHz to 60 MHz and Telkom's 28 MHz to 30 MHz and that the remainder must be divided into 50 and 60 MHz for two licensees or closed bid for them and Telkom to bid for 10 MHz and a single lot of 100 MHz.

The Authority's response:

The Authority issues licences on a technology neutral basis. The IMT3500 is to be licensed in accordance with its Radio Frequency Spectrum Assignment Plan in force. The Authority endeavours to attract qualified bidders to opt-in during the Auction Process to acquire the additional 2 MHz and 4 MHz spectrum as an opt-in at the prescribed reserve price.

85. Regarding the 2.3 GHz frequency band, **Telkom** points out that the Authority decided that "A feasibility study is to be conducted", which is to address the migration of the existing users from the band. Although the feasibility study has not yet been done as per the prescribed regulations, and although this spectrum is used by **Telkom** for fixed terrestrial services, the Authority disregarded its own regulations and proceeds on the basis that the band is available for licensing. **Telkom** also pays annual fees for the use of this spectrum. The Authority is proposing to licence 2360-2400 MHz. However, **Telkom** is currently licensed to use 2360-2387 MHz in this spectrum band. **Telkom** is currently using this

spectrum to provide services (mostly in rural areas), pays the relevant licence fees and cannot be simply removed from this band.

The Authority's response:

The available spectrum in the IMT2300 band will be licensed in future, taking into consideration the feasibility study to be conducted in accordance with the Radio Frequency Spectrum Assignment Plan for the frequency band IMT2300 published in the Government Gazette Number 38755 (Notice 392 of 2015).

The Authority's response:

The proposal by CIVH is not feasible because the Authority has resolved to commence the licensing processes for the I-ECNS Licence to provide a WOAN and the licensing process to assign spectrum to the Industry simultaneously. However, it is very unlikely that the spectrum award and the issuance of the I-ECNS licence to the WOAN, will happen at the same time – given the different regulatory processes attendant upon each respective process. Furthermore, upon the award of the spectrum through the auction, the Licensees are expected to deploy their networks in order to meet the set obligations and licence conditions.

SUMMARY

The Authority notes the views raised by the various respondents to the IM as summarised above. The Authority believes that unbundling the bands will ensure flexibility for the I-ECNS Licensees to compete fairly for the spectrum based on what spectrum band each licensee values the most and that it (the unbundling) may fully serve the objective to promote

competition. The Authority believes setting aside spectrum (IMT700: 2x10 MHz; IMT2600: 1x30 MHz; IMT3500: 1x30 MHz) for the WOAN will ensure that it is a credible wholesale player.

The issue of the ecosystem will be taken into consideration when assigning the sub-1 GHz spectrum to the WOAN. The Authority must ensure that the spectrum assigned is used efficiently as required by the ECA.

The intention of the Auction is to reveal the true fair value of the spectrum (including IMT3500), hence the spectrum will ultimately be assigned to the I-ECNS Licensees who value it the most.

The Authority extended the licence period of the RFSL from 15 years as it was stipulated on the IM to 20 years, in order to take accommodate the delays in the availability of the spectrum in IMT700 and IMT800 bands which are subject to digital migration process which is currently underway.

The Authority issues licences on a technology neutral basis. The Radio Frequency Spectrum Licences of the incumbents on the IMT3500 were amended in accordance with the Radio Frequency Spectrum Assignment Plan for the IMT3500. The Authority endeavours to attract the qualified bidders to opt-in during the Auction Process to acquire 2 MHz and 4 MHz spectrum as an opt-in round at the prescribed reserve price.

SPECTRUM OBLIGATIONS

87. **CIVH** is aware that two regulatory authorities, namely the Competition Commission and ICASA, are both carrying out market inquiries now. CIVH suggests that ICASA await the outcome of both inquiries and consider imposing conditions from an informed position.

The Authority's response:

The CCSA has provided its input during the consultation process for the IM and the Authority has considered those inputs. Furthermore, the

Authority has conducted its own independent Competition Assessment that informs this licensing process. The Mobile Broadband Inquiry (MBI) currently underway is a separate process.

88. **DG Murray Trust** proposes that one of the conditions of the new spectrum licences issued under this process should be: All Mobile Content provided by Public Benefit Organisation be zero-rated with the operational cost borne by successful bidders.
89. **FCC Projects and Services, Sun and Shield, Unique Net, Day Dreamer, Bowline Safeguarding, Go-Bee, Juice Telecom, Tuse Application and EC Internet** propose the Universal Service Obligation on existing and new licensees to provide a Community Data Service at subsidised prices, similar to the previous Community Service Telephones in underserved areas.
90. Similarly, the **DPSA** proposes zero-rating of interconnection between government departments as an obligation.
91. In addition to that, the **DPSA** proposes that all government domain names be zero-rated. The following is further proposed: 1. All government schools should be connected free of charge and successful bidders should avail their digital platforms for use to provide online/digital education content; All government health facilities must be connected for free of charge; All registered emerging/small farms of the previously disadvantaged people must be connected at no cost; Successful bidders must ensure that they self-provide the alternative source to ensure continuous availability of their networks and services in accordance with their uptime commitments.

The Authority's response:

The Authority had requested suggestions on the IM in respect of the social obligations to be considered. The Authority has decided to include the social obligation: zero-rating of identified Mobile Content provided by Public Benefit Organisations. The proposal in relation to subsidised prices is not in line with section 2 (y) of the ECA.

COVERAGE

92. **FCC Projects and Services, Sun and Shield, Unique Net, Day Dreamer, Bowline Safeguarding, Go-Bee, AABA, Juice Telecom, Tuse Application and EC Internet** support the proposal to require rural coverage before licensees are allowed to use the spectrum in urban areas. Furthermore, the **DPSA** proposes the social obligation to improve network coverage in rural areas thus ensuring that e-Government and Smart City Services are accessible to all citizens equitably.
93. **Rain and ISPA** submit that the Coverage and Capacity obligations are very expensive and would impact on data prices negatively should they be met in the deep rural areas. Whereas, **Cell C** does not support 100% coverage obligation in the current status of the economy. Coverage and Capacity targets are onerous and costly, and may lead to increased cost to communicate, submit **CCSA**. These obligations may lead to either smaller firms not bidding for spectrum or having to drive up prices in order to cover the costs involved therefore reducing access due to worsening affordability. **CCSA** suggest that these obligations be aligned with those of SA Connect Policy.
94. **Telkom** submits that the two dominant operators, MTN and Vodacom; should they win spectrum through this licensing process, must have an obligation to make services available to 100% of the population excluding SKA area.
95. **MTN** notes that the Authority has referenced OpenSignal's State of LTE report (February 2018) for LTE coverage. This report shows that there is no country in the world with 100% LTE coverage. The country with the best LTE coverage has 97.5% and only 5 countries have population coverage greater than 90% (South Korea, Japan, Norway, Hong Kong, USA). **MTN** notes that in the newer OpenSignal 'The State of Mobile Network Experience' report of May 2019, the best country in the world is still at 97.5% LTE coverage. Assuming that clear 700 / 800 MHz spectrum becomes available according to the proposed schedule, MTN proposes that the following obligation be imposed to all spectrum holders in the network performance profile:

95.1 by end of year 2023, population coverage for broadband services meeting the specified quality of service level should be equal to 85%; and

95.2 by end of year 2026, population coverage should be equal to 95%.

96. **WAPA** welcomes the imposition of service level obligations in general terms but would question whether a 100% coverage obligation is practically attainable. The imposition of geographic coverage and service level obligations is welcomed although **WAPA** request clarity regarding the conflict which arises when reading paragraph 6.1.2 with paragraph 6.2.3 of the IM. Specifically, a licensee is unable to only provide services to 97% of the population within an identified underserved area whilst simultaneously being expected to provide services to 100% of the population as a whole.
97. In addition, **SAFC** submits that Sections 6.2.5 – 6 of the IM indicate that the holders of Lot B, C and D in all the options will each have a maximum of three years from the date that the 700 MHz and 800 MHz spectrum becomes available to provide services to all identified underserved areas. However, point 6.1.2 stipulates that a Licensee must provide data services across the country with set obligations by 2025. To avoid the ambiguity that may result from an overlap of one time-bound obligation over another, the Authority needs to ascertain that the obligations are sufficiently detailed, measurable and are timebound.
98. **CIVH** proposes that the uplink and throughput KPIs are set based on the final allocation of spectrum lots and specific to each band. Further, the proposal is that the performance KPIs to be included in any licence are measured from the RAN equipment and not via field measurements and on a regional or cluster basis. 100% population coverage with proposed uplink and downlink throughput performance is unlikely to be commercially viable and sustainable.
99. **Cell C** adds that the obligation of other players should not be similar to those of MTN and Vodacom. With regards to capacity and coverage obligations, **RAIN** argues that only two operators have access to infrastructure required to meet these obligations. In the same breath, **Telkom** submits that the coverage obligation as set on the Information Memorandum are discriminatory against smaller Mobile Network Operators (I-ECNS Licensees) since the larger operators

will find it easier to achieve them because they have significantly more sites than the smaller I-ECNS Licensees. Similarly, **CCSA** adds that the coverage and capacity obligations may be restricted to those networks with existing national coverage, Vodacom and MTN, and which have a dominant position in the mobile market in any event.

The Authority's response:

The Coverage Lot carries an obligation that the winner shall cover the 99.8% of the population of South Africa where people reside within Local Municipalities, this obligation shall be achieved within 5 year of the issuance of a licence. The Coverage Lot obligation in relation to Batch 2 and Batch 3 underserviced areas/municipalities is to cover a minimum of 95% and this should be achieved also within 5 year of the issuance of a licence.

Furthermore, the Authority resolved that the winner of this 2x10MHz (sub-1GHz) Coverage Lot is to implement outside-in approach to achieve 95% of all Batch 2 and Batch 3 underserviced areas. This LOT will have the reduced reserve price to ensure that the winner is not overburdened by the deployment cost.

The Authority also resolved that a tier-1 player who wins ANY further sub-1GHz spectrum shall expand coverage to at least 97% of the population. Furthermore, an outside-in approach shall apply to achieve 92% of all Batch 2 and Batch 3 underserviced areas first. This will ensure that all the Underserviced areas have coverage and that licensee are not overburdened by the network deployment costs.

The above was decided by the Authority in an effort to achieve one of the set objectives which is to promote the universal provision of electronic communications networks and electronic communications services and connectivity for all.

100. The **DPSA** proposes that ICASA establish the Monitoring and Evaluation Unit to monitor Social Obligations (Licence Conditions) that will be imposed in respect to this licensing process. The **DPSA** further indicate that it may play role in assisting ICASA in respect to monitoring progress.

The Authority's response :

The Authority is structured in such a way that there are Compliance and Monitoring Units which deal with compliance and consumer issues including the CCC where matters of non-compliance are referred to.

MVNO

101. **Rain** supports MVNO obligation. Whereas **Cell C** argues that MVNO are not regulated entities, they are resellers, commercial entities. ICASA has no jurisdiction over the MVNO. Paragraphs 6.3.1 to 6.3.2 are meaningless obligations. **Cell C** further argues that it does not make sense for MVNO Obligation to be imposed to the Licensees whereas they are supposed to be commercially served by the WOAN. Similarly, **MTN** recommends that all MVNO access obligations be removed from Licensees. According to **MTN**, for MVNO to be provided with access it must be on fair commercially negotiated terms. Open Access Obligation for the WOAN on MNO should be fair, reasonable and commercially negotiated terms.
102. The **CCSA** is of the view that putting the obligation of carrying 3 MVNO's with 51% HDG's to MNO's may work against the business case of the WOAN. They argue that the rationale for the WOAN was to provide more support for service-based competition from MVNOs, and to support overall transformation of the industry. Furthermore, the **CCSA** is of the view that instead of committing to a number of MVNOs, I-ECNS Licensees receiving spectrum should rather commit to a standard MVNO agreement where the maximum wholesale rate per GB is at a discount to the average retail rate of the I-ECNS Licensees and this obligation be applicable to all operators including those that receive spectrum lots in the 2300MHz and plus 3500MHz range.
103. **Vodacom** wants the WOAN to compete with other licensees for MVNO business. However, **Telkom** submits that MVNO should be catered by the WOAN to enable

- viability of the WOAN. Forcing MVNOs to MNO will undermine the viability of the WOAN.
104. **Telkom** proposes that the Authority should remove MVNO obligation. It is proposing that licensees should be obliged only to offer MVNOs access rather than mandating that licensees sign agreements with MVNOs.
105. Whereas **ICT SMME** submits that I-ECNS Licensees should be obligated to carry one MVNO as opposed to three to ensure the sustainability of the WOAN. Furthermore, it adds that a bidder interested in participating in the Spectrum auction must have submitted, 30 days ahead of the actual auction date, a signed, verifiable "Partnership Agreement" to the Authority. The object of this process being to prove a new, genuine black ownership of the contracted MVNO.
106. **ISPA** argues that the term "Mobile Virtual Network Operator" or "MVNOs" is generic, covering a variety of commercial and technical models. These range from "brand resellers" to "full MVNOs" depending on the extent to which the MVNO operator gains access to the network of the host MNO. There is a vast difference between these models. The Authority should be specific in framing the obligation and it is likely that a regulatory framework will need to be emplaced.
107. In order for the proposed obligations to have any meaningful impact on the market, MVNO operation at the active infrastructure level should be empowered through necessary amendments to both the Electronic Communications Act ("the ECA") and Radio Frequency Spectrum Regulations, 2015, **WAPA** adds.
108. **CIVH** proposes that the obligation for the industry to provide access to a minimum of three MVNOs (each) could reduce demand for the WOAN capacity by MVNOs. Going further to declare that in their view the obligation on the industry to carry MVNOs should be lifted.
109. Furthermore, the following matters require further clarification by the Authority: Would a Licensee be considered to meet its obligation if it was to carry three MVNOs with only a few subscribers?

The Authority's response :

The Authority is mandated, amongst other functions, to promote transformation in the ICT sector. Furthermore, the Authority is of view that there are mechanisms that promote transformation in the sector by encouraging I-ECNS Licensees to support the uptake and the provision of the MVNOs. An MVNO is generally regarded as a wireless communications services provider that does not own the wireless network infrastructure over which the MVNO provides services to its customers.

It is also the Authority's view that requiring the industry to support MVNOs will build a potential market for MVNOs.

30% OFFTAKE

110. **Rain** and **Cell C** propose that market share be used as parameter in determining how much capacity each successful bidder need to procure the 30% capacity from the WOAN. **Rain** adds that it would only buy capacity from the WOAN if the WOAN has suitable coverage and commercial offerings that are attractive. **Cell C** further adds that the Authority should provide oversight details that it will provide to the WOAN to see the offtake being successful.
111. **MzansiWOAN** submit that the Authority must oblige Industry (all holders of High Demand Spectrum) to give a guaranteed commitment or Legally Binding Procurement Plan on the offtake - a minimum of 30% national capacity offtake of procurement from the WOAN as a Pre-Qualification Criteria for awarding of HDS to industry.
112. **Vodacom** says WOAN must have its own operational network first before it can be guaranteed capacity offtake. It adds that this initiative will create incentive for WOAN to create its own network. However, **Vodacom** is not clear as to how is the WOAN going to secure funding to build the network because usually financial institutions need to see the commitment of uptake before they can extend loans.
113. **Vodacom** proposes the change in circumstances regarding the 30% offtake that licensees should be released from their obligations like capacity pre-commitments,

should WOAN's controlling stake be acquired or should it form a joint venture with one of the existing operators.

114. **Liquid Telecom** submits that it is not clear how the stakeholders can comment on the offtake when there is no WOAN in existence, no timelines and no pricing against which to evaluate the impact of the obligation and preparing a business case for the auction process. It is not clear if the obligation relates to 30% of the WOAN national capacity or the new licensees' national capacity and how is the collective off-take to be divided between such licensees.

115. Whereas **ICT SMME** proposes that licensed operators must acquire 100% of "their individual capacity requirements" from the WOAN in underserved areas and further that licensed operators must acquire 60% of "their individual capacity requirements" from the WOAN.

116. **MTN** raises the following questions regarding the Offtake Capacity:

116.1 the coverage and quality of service of the WOAN network;

116.2 the future, annual capacity that the WOAN will make available on a wholesale basis;

116.3 the charges that will be made for this capacity;

116.4 the terms upon which the industry will make infrastructure available to the WOAN; and

116.5 the duration for which any measures related to the WOAN will continue to be applied to the industry.

117. Whereas **Telkom** adds that the Authority needs to consider whether the 30% offtake target is a national or regional target. The offtake should be applied to dominant players.

118. **CIVH** is in support of all the national objectives articulated in the Information Memorandum (IM). **CIVH** further argued that although the Minister abandoned the ECA amendment, the minister and operators made certain commitments including taking off up to 30% of capacity from the WOAN during the course of its life.

119. **CIVH** suggests that the Authority should provide the interpretation of the 30% capacity to the WOAN. It further suggests that the term "A minimum of 30% of national capacity" should be stated to mean "A minimum of 30% of the WOAN's national capacity". With measurement taking place on one date or being repeated on an anniversary basis for a specified period. Clarity is sought as to whether the I-ECNS Licensees are expected to pay for 30% of the WOAN capacity irrespective of what is used in which case such licensees could decide to simply pay the 30% as an additional fixed "licensing cost" and not use the WOAN network at all. ICASA will need to decide if this should be permitted.

119.1 **SMILE** proposes a 30% offtake commitment in urban areas from radio frequency licensees for a period of 10 years for the viability of the WOAN.

120. **Vodacom** supports, in principle, (i) WOAN benefitting from capacity pre-commitment from licensees (ii) WOAN enjoying some accommodation on payment for the high demand spectrum (iii) Vodacom is OPPOSED to ICASA imposing licence conditions requirements on passive access and national roaming to assist the WOAN.

121. **SMILE** argues that for the WOAN to be commercially viable the following regulatory advantage should be provided for the WOAN i.e. a 50% offtake commitment from government.

The Authority's response:

The Authority is implementing the minimum 30% offtake obligation in support of the WOAN's viability for a period of 5 years starting as soon as the WOAN is operational. The 30% national capacity to be procured from the WOAN will be shared proportionally to the amount of the spectrum acquired from the Auction amongst the successful licensees. The incentive to the WOAN will be imposed to all successful applicants as licence terms and conditions in accordance with regulation 7(2)(e) of the Radio Frequency Spectrum Regulations, 2015 as amended.

FACILITY LEASING AND INFRASTRUCTURE

122. **RAIN** has no objection in providing access to its infrastructure to the WOAN on commercially reasonable terms. **RAIN** suggests that this obligation be extended to all operators to offer access to infrastructure at reasonable commercial terms, without creating artificial technical barriers to doing so.
123. **Vodacom** suggest that WOAN should use facilities leasing regulations to get access to the passive infrastructure.
124. Whereas, **Liquid Telecom** argues that the obligation to provide access to active and passive infrastructure to the WOAN may require review of the existing facilities leasing regulation, and instead proposes that this apply only to holders of new spectrum licences.
125. **Telkom** submits that the WOAN plays a special role in the mobile market and, in its view, the Authority should attempt to support the commercial viability of the WOAN through this licensing process. As such, the WOAN should be given preferential access to the facilities of dominant operators. No seamless roaming requirement. **Telkom** indicates that the Authority should not dictate terms as this is a commercial agreement.
126. **WAPA** is in firm support of the obligations set out in paragraph 6.4 of the IM, particularly those pertaining to wholesale access to passive and active infrastructure and the provision of seamless national roaming. **WAPA** encourages the Authority to take all reasonable measures to ensure that the process detailed in paragraph 6.4.9 unfolds smoothly and that the resources needed for the resolution of disputes and/or performance of investigations are in place.
127. **ISPA** supports of the obligations set out in paragraph 6.4 of the IM, particularly those pertaining to wholesale access to passive and active infrastructure and the provision of seamless national roaming¹⁷.

¹⁷ Obligations intended to be imposed to the WOAN

128. **SMILE** argues that for the WOAN to be commercially viable it should be provided access to the passive and active infrastructure of operators on a cost-based basis.
129. **SAFC** notes that infrastructure sharing, and facilities leasing are key pro-competitive measures. However, the Authority would need to do periodic reviews to ascertain the ongoing efficacy of the existing regulations and close the gaps in the regulations where necessary.

The Authority's response:

The WOAN and other Licensees are subjected to the Facilities Leasing Regulations in force to deal with access to electronic communication facilities, therefore no preferential treatment will be provided to any licensee.

EMPOWERMENT PROVISIONS

130. **MzansiWOAN** submits that as prequalification criteria for participation in the licensing process a licensee must attain a Level 1 or 2 B-BBEE Status in terms of the Codes of Good Practice applicable to the ICT Sector as published in terms of section 9(1) of the B-BBEE Act and maintain such status for the period of the licence.
131. **MzansiWOAN** strongly believes that the Authority is being unnecessarily lenient in allowing 36 months to achieve level 3 for compliance by the industry related to their access to High Demand Spectrum. Moreover, it states that it hopes ICASA will, through the BBEE Commission, implement strong compliance mechanics, enforcement through penalties and licence withdrawal where necessary should industry not comply to the outlined licence conditions.
132. Par 6.6.2 proposes that a Licensee must within 36 months of being issued with a radio frequency spectrum license reach a level-3 B-BBEE contributor status. **ICT SMME** oppose this proposition as having failed many times before and as being futile to assist ICASA achieve the intended objectives of B-BBEE. For licensed

operators older than 10 years, a Level-1 contributor status must be a prerequisite to HD spectrum auction.

133. **SACF** supports the Authority's principle that seeks to encourage greater compliance with the B-BBEE ICT Code. However, it disagrees with the proposal of licensees progressing to Level 3 after 36 months. This is simply too long and the Level too low. According to the **SACF's** knowledge, the DTI does not have a compliance period, therefore SACF proposes an additional clause that makes provision for a reasonable transition period for compliance, with a minimum of 12 months. **SACF** further submit that it is critical that the transition period be aligned with the materiality of the amendments. The evidence of the materiality would be demonstrated by the level by which compliance levels fall. Such a transitional period is essential due to the applicable costs associated with achieving BBBEE compliance.

134. **Liquid Telecom** submit that Empowerment obligations are vague and unspecific. Therefore, it is impossible for stakeholders to propose meaningful recommendations on the type, scope, nature and criteria for imposing social obligations on licensees in the absence of parameters on timelines, pricing and declination of underserved areas.

135. **CIVH** notes that it may be difficult for the WOAN to achieve Level 3 compliance within 3 years of licence award.

136. **Ramusi Group-** state that the Authority must specify the following thresholds for all participants in this opportunity: visible participation which should also translate to service provider's ownership model in the ICT sector and must be based on the following criteria:

136.1 45% Youth (as defined),

136.2 10% Women, and

136.3 15% Person with Disability.

The Authority's response :

The Radio Frequency Spectrum Regulations, read with the ECA, stipulates the empowerment provisions which applicants must adhere to.

The Authority is of the view that a licensee must, within 12 months of being issued with a radio frequency spectrum licence, reach a Level 1 contributor (BBBEE status) in terms of the Codes of Good Practice, applicable to the ICT Sector, published in terms of Section 9(1) of the BBBEE Act and maintain such status for the duration of the licence. This License condition is to promote transformation within the ICT Sector.

UNDERSERVICED AREAS

137. **Cell C** requests that the definition of the "Identified Geographic Areas" be provided. **Altron** proposes, regarding underserviced areas, a roll out prioritisation approach from a perspective of a 'quick wins' policy - starting from the most populated rural and underserviced areas, thus providing broadband access connectivity to the highest number of users in the shortest possible time. Altron submits that the province of Kwa-Zulu Natal would be a good place to start. Further 'quick wins' could be facilitated by licensees providing indoor / outdoor Wi-Fi bandwidth, interlinked through an LTE modem from a distant site for: rural schools, hospitals, clinics, community centres, police stations etc.
138. Identification of Underserviced areas: **Vodacom** advocates for limitation of rural obligation to the areas that have backhaul network already in place. Secondly, it adds **Telkom** dominated this backhaul market and in turn charges more for this service, the cost that end up being passed on to rural consumers.
139. **Vodacom** is against Rural-first obligation. It says it will work against the reduction of data prices.
140. Meanwhile **LT** submits that the WOAN should be addressing underserviced areas by virtue of its genesis. **LT** further proposes a "contribution regime" to a fund where projects are funded for roll out to underserved areas on a bidder basis. The In and Out rollout obligation is not supported at 97% because it is expensive to fund the infrastructure. Furthermore, **Telkom** does not support the Outside-In obligation.

141. Similarly, **SACF** submit that the Obligation on Licensees to rollout the broadband network to 97% of the population in all the identified underserved areas before rolling out in the cities is commercially unsustainable and will increase the cost to communicate. It would be prudent for the Authority to license the high demand spectrum (esp.: IMT700 and IMT800) now but defer the licence date and payment thereto until the point that the spectrum becomes available. Aligning the effective date of the licence and payment of licence fees to the availability of spectrum will not further delay access to spectrum.
142. **WAPA** welcomes the imposition of service level obligations in general terms but questions whether a 100% coverage obligation is practically attainable. The imposition of geographic coverage and service level obligations is welcomed although **WAPA** request clarity regarding the conflict which arises when reading paragraph 6.1.2 with paragraph 6.2.3 of the IM. Specifically, a licensee is unable to only provide services to 97% of the population within an identified underserved area whilst simultaneously being expected to provide services to 100% of the population as a whole.
143. **MTN** recommends that the Authority adopts its existing definition of Underserved areas. A 97% coverage obligation in Underserved areas is uneconomic and **MTN** proposes that this obligation is reduced to 90% coverage with a minimum downlink performance of 10 Mbps. **MTN** is supportive of a reverse roll-out requirement subject to the availability of spectrum and reasonable, economic obligations.
144. **Vodacom** suggests a period of 5 years instead of 3 years after the spectrum becomes available for operator to provide services to the identified underserved areas.
145. Meanwhile, **ICT SMME** suggests that any interested auction bidders must submit their services rollout plan/s to the Authority 30 days ahead of auction day for evaluation or authentication. Based on its assessment, the Authority may or may not reject the submitted plan.
146. **ISPA** is concerned that a process for determining underserved areas has the potential to significantly delay the finalization of the licenses to be issued to

successful participants. The Under-Serviced Area Regulations 2012 have not been updated as required and will have to be revised, taking into account concepts such as “meaningful connectivity” in a South African context.

147. In addition to that, **WAPA** adds regarding the process of identifying underserved areas, the Authority would presumably need to undertake a renewed process to that contemplated by the Under-Serviced Areas Definition Regulations.

148. Furthermore, **Cell C** adds that the In-Out Obligation blocks the immediate use of the IMT2600 because the IMT700 and IMT800 suited for rural deployment will only be available after three years.

The Authority's response:

The Authority has selected certain areas, specified in the Under-Service Area Regulations, 2011¹⁸ which it categorised into three Batches (Batch 1: Areas with Good Coverage, Batch 2: Areas with Fair Coverage and Batch 3: Areas with Poor coverage) to allow for the coverage obligations for winners of Lots in the IMT700 and IMT800 bands.

The coverage obligations are as set out below and are informed by the competition assessment.

The Authority has considered and decided that the winner of one the 2x10MHz (sub-1GHz) Coverage Lot will carry a coverage obligation of up to 99.8% of the population within 5 years of issue of the spectrum licence, and at least to 95% across totality of ALL Batch 2 and Batch 3 underserved areas/municipalities in South Africa.

Furthermore, the Authority has considered and decided that the winner of this 2x10MHz (sub-1GHz) Coverage Lot must implement an outside-in approach to achieve 95% of all Batch 2 and Batch 3 underserved areas. This LOT will have a reduced reserve price to ensure that the winner is not overburdened by the deployment cost.

¹⁸ Published in the Government Gazette No. 35675 (Notice No. R. 734) on 10 September 2012

The Authority has considered and decided that other tier-1 players who win ANY further sub-1GHz spectrum, must expand coverage to at least 97% of the population. Additionally, an outside-in approach to achieve 92% of all Batch 2 and Batch 3 underserved areas first is imposed. This will ensure that all the Underserved areas have coverage and that licensees are not overburdened by the network deployment costs.

Under-Service Area Definition Regulations, 2011 includes all the municipalities of South Africa. Therefore, areas that do not have coverage will be accommodated.

Methodology Used in classifying the Batches

The classification was done using data as published within the Under-Service Area Definition Regulations of 2011.

The Averages of the following Variables (Internet, Computer, and Cellphones) were used. The Telephones variable was not used since these services are gradually being discontinued, especially in Rural Areas due to infrastructure erosion and non-availability of networks.

Classification Technique Used

The Jenks optimization method, also called the Jenks natural breaks classification method, was used. It is a data classification method designed to optimize the arrangement of a set of values into "natural" classes.

A natural class is the most optimal class range found "naturally" in a data set. A class range is composed of items with similar characteristics that form a "natural" group within a data set.

This classification method seeks to minimize the average deviation from the class mean while maximizing the deviation from the means of the other groups. The method reduces the variance within classes and maximizes the variance between classes.

It is also known as the goodness of variance fit (GVF), which equals the subtraction of SDCM (sum of squared deviations for class means) from SDAM (sum of squared deviations for array mean).

SOCIAL OBLIGATION

149. **CCSA** proposes the following on Social Obligations:

- 149.1 Licensees to provide small amount of free data or zero-rated content obligation must be placed on licensee;
- 149.2 Force Operators to commit to the reduction of prices on specific products, more so the dominant operators;
- 149.3 Customers be informed of the true effective price of data used each month. Transparency will reinforce competition and enable users to switch to lower priced options.

150. On Open Access Obligation on Licensee, **CCSA** propose that I-ECNS Licensees:

- 150.1 provide MVNO and roaming services according to standard service and pricing arrangements that provide for quality access at true wholesale prices that are below the retail price of the operator;
- 150.2 offer standard quality and pricing arrangement or agreements on facilities and site access, with an obligation for cost-based access where facilities are defined as essential facilities;
- 150.3 implement full accounting separation for their wholesale network infrastructure, including the radio access network (RAN) and core network.

The Authority's response:

The Authority's response is that these views expressed by the respondents are out of scope and should be dealt with through other regulatory processes of the Authority. However, the Authority is mindful that these obligations / interventions may not be adequate to address the structural and other inefficiencies in the market.

Furthermore, the Authority imposed social obligations on Licensee assigned spectrum through this process that it shall zero-rate all the Mobile Content provided by Public Benefit Organisations including.gov.za websites.

CAPACITY

151. **Vodacom** recommends a sub 1GHz performance benchmark of 30Mbps average downlink and 15Mbps uplink as measured at the Antenna, to 96.8% of the population within 5 years of the spectrum being made available.
152. **CIVH** stated that typical broadband traffic downlink: uplink ratios are substantially higher than the 2:1 implied in paragraph 6.1.2 of the IM. Ratios on broadband networks can be anywhere between 8:1 - 20:1 and as video consumption grows as a percentage of total traffic (predicted to be 75% of mobile traffic by 2022) the ratio becomes even more asymmetric¹⁹. **CIVH** seeks clarity in respect to the 30 Mbit/s downlink throughput between 07:00 to 20:00 (a period that includes peak traffic demand hours) and whether it is meant to be for 100% population coverage as stated in paragraph 6.1 of the IM.
153. Further **CIVH** expresses a view that coverage and performance obligations should be decoupled for low and mid bands and targets should be defined based on the quantum of spectrum in each lot.
154. Furthermore, **CIVH** asserts that there is a correlation between availability and speed. Speeds on highly accessible networks can be limited by capacity constraints, whereas LTE networks with limited 4G availability can support considerably fast speeds due to their light loads.
155. Whereas **MTN** proposes the following quality of service obligation where the measuring device is capable of using all the features available from the network including high orders of MIMO, carrier aggregation and DL256QAM etc.:

¹⁹ <https://www.ericsson.com/en/trends-and-insights/consumerlab/consumer-insights/reports/tv-and-media-2017>

155.1 By 2024 Downlink 25 Mbps; and

155.2 By 2027 Downlink 30 Mbps.

156. **Telkom** submits that the download throughput obligation should be defined as an average of 30 Mbps and should be measured through crowd-sourced data. Users will, on average, obtain 30 Mbps, but will experience some variation around this figure.

157. **SACF** finds the user experience obligations set in the IM onerous as it does not account for the difficulty and cost of last mile infrastructure. **SACF** recommends that the obligation be amended to "an average of uplink of 15 Mbit/s and the downlink user experience throughput of at least 30 Mbit/s to 98% of the population in 2030" to allow for the requisite infrastructure deployment and to better align with the SA Connect targets.

158. Furthermore, **Telkom** argues that the download speed of 30 Mbps obligation would be extremely costly for any operator in South Africa to meet but would be disproportionately so for the smaller operators. **LT** support the uplink and downlink speeds to 100% population of SA as far as it relates to spectrum assigned through the Auction.

The Authority's response:

The Authority has considered submissions and decided to impose a Downlink single user throughput of 5 Mbps at the edge of the cell (particularly in Batch 3 classified municipalities) for all national wholesalers who are awarded radio frequency spectrum licenses on spectrum band(s) IMT700 and/or IMT800 within five (5) years of licence issue. This obligation must be achieved with other bands (i.e. IMT2600, and IMT3500) assigned through this licensing process.

THE AWARD PROCESS

159. **Qualcomm** supports the use of the three-stage award process as outlined in the IM as it considers the auction mechanism approach with affordable reserve prices as the most efficient approach to ensure that spectrum is put to its highest-value

use. The inclusion of a qualification stage will ensure that any potential licensee is adequately qualified to provide services in South Africa.

160. **Ramusi Group** submits that the ITA must avoid enforcing the following exclusion clauses for SMMEs:

160.1 No applicant will be considered if they have no experience in managing or/and operating a similar network on offer;

160.2 No applicant will be considered if they do not have a network to prove experience and knowledge of having ran or managed a similar business;

160.3 No applicant will be offered the opportunity if they are not able to prove any amount to a tune of say, R100M available in your bank facilities or provide same as surety for the opportunity; and

160.4 No applicant will be considered if they are not in a joint venture with an established network provider.

161. **ICT SMME** propose the following in addition to Par 7.5.2.1 and Par 7.5.2.2 of the IM:

161.1 Applicants who are older than 10 years in business must submit their annual BEE Reports for the last 10 years, as part of their evaluation for qualification.

The Authority's response:

The qualification criteria to be imposed as a minimum, will be in accordance with the Regulation 7 of the Regulations²⁰. Some of the proposals above are covered in Form E of the Regulations. Any other information or requirements deemed necessary will be covered in accordance with regulation 7(2)(o) of the Regulations.

AUCTION

162. **Qualcomm, R2K, and Vodacom** submit that the use of a simultaneous multi-round auction with generic lots is a reasonable choice in order to allow bidders to focus on the number of lots for which they would like to bid.

²⁰ Radio Frequency Spectrum Regulations, 2015

163. **Telkom** submits that the Authority should Auction the spectrum via a Generic SMRA. The rules of the Auction should be outlined in an ITA.

164. In addition, whereas, **MTN** propose the following on the Auction Strategy:

164.1 a minimum of four months is allowed from the date of publication of the ITA to the start of the auction;

164.2 Generic Lots are used;

164.3 A multi-round auction format is adopted;

164.4 The SMRA is adopted rather than a CCA;

164.5 The simplest possible SMRA design is used and one which does not allow for withdrawals or switching;

164.6 Eligibility Rules are used to promote sincere bidding;

164.7 Bid increments are determined by the auctioneer and not the bidders;

164.8 the maximum amount of information relating to bidders, Lots and prices is provided on a round-by-round basis;

164.9 an Assignment Stage is included using a 2nd Price, Sealed Bid auction for the first rights to select specific Lots where Generic Lots are used in the main part of the auction;

164.10 an Unsold Lots round is included to ensure the complete success of the auction;

164.11 spectrum auction fees should be payable over a period of at least five years; and

164.12 a compensation mechanism should be in place if the availability of spectrum is delayed.

The Authority's response:

The format selected for the Auction is the Simultaneous Multiple Round Ascending (SMRA) auction. The Authority is of the view that this is the most efficient auction format in order for the true value of the spectrum to be discovered and achieve the set objectives for this licensing process.

The Auction may consist of one or more rounds, including Opt-in rounds. It will continue until there is a Round in which no new Bids are placed, and no Waivers are used.

In each Round, Bidders will have an opportunity to place Bids on any of the available Lots, provided that those Bids do not break the Activity Rules and Spectrum Caps.

The Auction Fees must be paid into the specified Authority's bank account within thirty (30) working days after the public announcement of the award process results by the Authority.

GENERAL COMMENTS

165. The Authority received 354 e-mail petitions through the Dear SA Parliamentary platform regarding the 5G bill. The IM was listed on Dear SA Parliamentary platform as a 5G bill requesting the public to have their say, 247 e-mail partitions were against the 5G bill and the remainder were in support.

The Authority's response:

The Authority is of the opinion that the views expressed on 5G Bill is out of scope for this licensing process.

166. **Zavuna Technologies** indicate that the Current LOTs are designed for 4G not 5G.

167. **CCSA** submits that it is likely to be prudent to first assess the full range of spectrum to be made available and the implications of licensing design across all those spectrum bands for future 5G competition, infrastructure sharing and new entry

(even of currently unlicensed firms), they furthermore point out to the policy directive in which a study of 5G bands.

The Authority's response:

The ECA provides for a technology neutral licence framework. Therefore, all licences that will be issued under this licensing process will be issued on a technology neutral basis in accordance with the provisions in ECA.

168. **CCSA** also suggests that spectrum should be assigned to a number of firms to ensure that cost benefits are felt broadly across the market.

The Authority's response:

The Authority is of view that the use of the Auction method and spectrum caps allow for spectrum to be licensed to a number of licensees in a competitive and fair manner.

169. **SEC** argues that a long-sighted and professional spectrum management is required; clean-up required spectrum bands for reuse; leave network planning, operation and maintenance to the private sector. To reduce telecommunications pricing, **SEC** recommend revising and implementing infrastructure sharing and multi-sector infrastructure (power grid, railways, public roads, etc.) sharing policies, and making applications, approval processes and fees for constructions (conduits for fiber cables, telecom towers, base station on buildings, telecom facilities) clearer and more predictable ("Right of Way"). **SEC** states that about 70-80% of telecommunications costs are infrastructure related costs.

170. **MTN** urges the Authority to consider relaxing the regulations to enable flexibility. This can lead to the following benefits:

- 170.1 provide for the possibility of both regional and national use following a national award;
- 170.2 establish a secondary market for spectrum and promotes efficient spectrum use;
- 170.3 reduce the administrative burden of issuing new licenses;

170.4 deters hoarding of spectrum;

170.5 has the ability to improve rural coverage and affordability; and

170.6 has the potential to drive significant cost savings.

171. **ISPA** submit that the sharing agreements such as that between Vodacom and Rain, the availability of wholesale services from Liquid Telecom and question marks over the future of Cell C and its substantial spectrum holdings have already alleviated spectrum constraints to some extent. In finalizing an ITA, **ISPA** submits that the Authority needs to take into account the Competition Commission's report and the MBS Discussion Document, with specific references to pro-competitive measures proposed in both.

172. **Telkom** request that universal service obligation set should be "competitively neutral and non-discriminatory", "transparent" and with "clear targets". It further adds that the Authority does not appear to have considered the potential effects on wholesale and retail competition of its proposed spectrum licensing process.

The Authority's response:

The views raised above has been noted. The Authority has conducted the competition assessment which guided the Authority in imposing fair universal service obligations.

173. **SACF** further submits that to date no feasibility study has been conducted to determine the number of players that the South African communications market could sustain (includes mobile and fixed services). As such it would be difficult for the Authority to impose a specified number of players as a licence obligation. One of the primary objectives of licensing IMT spectrum is to reduce the cost to communicate.

174. **Telkom** adds that the Authority simply states its proposals in the IM but does not document how it has assessed what the impact on competition might be of its proposed spectrum licensing process. Did the Authority consider the competition study as to how the licensing will affect the Market in the next 10 years? CSIR's study is flawed and should not be used to make crucial spectrum policies.

The Authority's response:

The Authority is of the view that the Competition Assessment it has conducted is sufficient to support this licensing process.

175. **LT** request that the Information Memorandum be re-published with sufficient baseline because the current IM does not have sufficient information.

176. **Cell C** recommends that the draft ITA be consulted on with the final Lots and Reserve Price.

The Authority's response:

The provisions of the ECA do not require that an ITA be consulted on. The ITA gives expression to the ECA, the Regulations and any other applicable regulatory instrument to the licensing process.

177. **SMILE** propose with regard to the HDS licenses for the industry that: the "Use it or lose it" principle must apply; spectrum award should be conditional upon the roll-out of network infrastructure in rural areas and capacity in urban areas must be procured from the WOAN; and failure to meet empowerment obligation should result in the withdrawal of spectrum licenses.

The Authority's response:

The Use-it-or-Lose it principle is regulated through the procedures to withdraw a radio frequency spectrum licence in terms of regulation 14 of the Regulations²¹. However, the Authority has a right to revoke the issued Radio Frequency Spectrum Licences should the terms and conditions be contravened with or spectrum being used inefficiently. Spectrum sharing is allowed under provisions of the Regulations.

²¹ Radio Frequency Spectrum Regulations, 2015

WOAN

178. **FCC Project and Service, Sun and Shield, Unique Net, Zavuna Technologies, Day Dreamer, Bowline Safeguarding, GO-Bee and AABA** submit that the WOAN should be 100% black owned for at least 20 years after the issuance of the Radio Frequency Spectrum Licences.
179. **FCC Project and Service, Sun and Shield, Unique Net, Zavuna Technologies and Day Dreamer** further request clarity on what support structure and assurance would be available to the WOAN Company.
180. **Zavuna Technologies** adds that any assignment of HDS spectrum assigned to any other entity other than the WOAN, should only be assigned when the WOAN is functional and profitable.
181. **Cell C** submits the following:
- 181.1 The seamless national roaming service access for 5 years on a cost orientated and non-discriminatory basis is not enough to even rollout the national coverage. This obligation should not apply up until such time that the WOAN has 20% market share. To note: the Authority should define the cost orientated term as it is not understood.
- 181.2 The process for the ECNS licence is not fully explained, the scoring criteria of the beauty contest should be included on the final ITA.
- 181.3 The WOAN process should be provided with the sufficient time for parties to form a WOAN based on an agreed and workable shareholding structure and the operational plan.
- 181.4 The WOAN should not be given the spectrum holiday. Regulatory Oversight and provision of service by the WOAN to the Government will assist the WOAN on its viability.

- 181.5 **Cell C** proposes that the WOAN be given a five-year period to meet the empowerment provision.
182. **SEC** submits that based on its own global experience it recommends reconsidering the proposed wholesale Wireless Open Access Network (WOAN) structure. WOAN implementation and sustainable operation and maintenance is very complex, the targeted benefits are in question. There is a high risk that WOAN fails or at least that there are major delays, which will have negative impact on international competitiveness and employment of the country. Furthermore, WOAN will limit rare spectrum availability for telecommunications operators and private sector companies further. Please also refer to the GSMA report highlighting the negative experience made with similar structures in other countries.
183. **LT** notes the lack of clarity regarding the WOAN structure and licensing. It urges ICASA to draw on extensive submissions made in other notices such as the EC Bill to help shape the WOAN. It also refers ICASA to failed well intended policy interventions such as BBI and USALS.
184. **CIVH** notes ICASA proposal as an incentive for applicants for the WOAN licence, such as the 'holiday'²². Further, **CIVH** proposes a 5-year 'holiday' at minimum. Furthermore; **CIVH** suggests that the holiday be extended perhaps for the lifetime of the WOAN licence, with payment being made only after the WOAN is operational, and in equal amounts for the remainder of the licence term.
185. **CIVH** is of the view that the WOAN cannot achieve even a 25% market share in the first 3 years of its operations. Price regulation is simply not appropriate until a reasonable market share has been achieved, and even then, only if there is evidence of anti-competitive behaviour or a failed market. **CIVH** highlights difficulty defining what an appropriate "cost-based" price might be. However, if ICASA is minded applying price regulation to the WOAN even at launch, then it may be more appropriate to consider a "retail minus" approach.
186. **SMILE** argues that for the WOAN to be commercially viable the following regulatory advantage should be provided for the WOAN: a 10-year obligation

²² Para 6.4.5 of the IM.

holiday following which the implementation of a maximum license fee of between R50-100 million payables of 5 years.

187. **Telkom** submits that WOAN is going to abuse the Spectrum Fee Holiday. Roaming obligations should be imposed.

The Authority's response:

The ITA for licensing of a I-ECNS to provide WOAN services has been published and the incentives applicable to the WOAN are detailed therein.

TIMING

188. **Bowline Safeguarding** recommend that the Authority should link the timing of the licensing of WOAN and award of High Demand spectrum to other licensees.

189. **MTN** supports simultaneous awards for spectrum.

190. **Cell C** further recommends that the WOAN be allowed to provide the services with the assigned spectrum ahead of the Industry holders of the auctioned spectrum.

191. **Telkom** proposes that the Spectrum assignment to the WOAN and I-ECNS Licensees should commence simultaneously and that the Authority should therefore not run the spectrum licensing and the WOAN licensing processes simultaneously but should do so sequentially. If the processes are executed simultaneously, it will create undue complexity and uncertainty in both processes and risk them failing.

192. **Telkom** submits that WOAN assignment process and the auction process should be undertaken sequentially.

The Authority's response:

The Authority decided to commence with the licensing processes for the for Industry and the WOAN simultaneously by publishing both the ITAs at the same time. The Authority notes that the two processes may not be concluded at the same time. The simultaneous commencement of the

licensing processes is marked by the publications of the ITA's on the same day.

RECOMMENDATIONS FROM THE IM SUBMISSIONS

193. **Zenzeleni and APC** recommend the following to deal with Universal services and empowerment at underserved areas:

193.1 Recommendation 1: Create a new Shared Access License that would permit geographically limited use in underserved rural areas of a selection of unassigned IMT frequencies by non-for-profit community networks and small commercial internet service providers.

193.2 Recommendation 2: Create a new Local Access License that would permit geographically limited use of IMT spectrum by community-owned networks in underserved rural areas that is assigned to an existing operator, but which is unused and of limited or no commercial interest.

193.3 Recommendation 3: Establish spectrum license fee exemptions for not-for-profit community-owned networks in order to enhance their viability in the most challenging services areas in the country.

194. **Telkom** adds that the licensing of the WOAN and the auction process will have a material impact on a range of stakeholders. As such, the Authority should undertake an RIA before concluding the process.

195. **Telkom** is looking for impact assessment of current spectrum holdings.

The Authority's response:

The Authority is aware that an RIA/SEIAS is a recommended best practice before introducing regulatory interventions. However, the Authority notes that a RIA/SEIAS is not a regulatory requirement. Nonetheless the Authority has carried out sufficient analysis and research through obtaining submissions on the IM and conducting a competition

assessment to inform this licensing process. Furthermore, spectrum sharing is permitted in the Regulations²³.

RESERVE PRICES FOR THE AUCTION

196. **Telkom** proposes that reserve Price should be low and do not maximise Government Revenue through reserve prices.
197. Whereas, **SMILE** adds that the reserve price set in the auction should aim to attract serious bidders and prioritise revenue for the fiscus.
198. **Vodacom** adds that it does not have the figure to propose as reserve price, but it advocate for it not to be too high to an extent that the winner will have no to capital to invest in the infrastructure.
199. **MTN** recommends that the Authority sets reserve price a low, but non-trivial Reserve Price to ensure auction participation by all operators and a successful award process.
200. **ISPA** submits that notions of scarcity do not justify the imposition of a high reserve price. ISPA supports the setting of low reserve prices which prioritises realisation of broader socio-economic benefits over short-term windfall gains to the fiscus. Policy objectives relating to the cost to communicate, transformation, universal access and competition will self-evidently not be realized if high reserve prices are set.
201. In the same breath, **WAPA** is convinced that there is a "scarcity" of spectrum such as to justify the imposition of high reserve prices. High Reserve price will lead to:
1. serve as an additional barrier to entry in what is already a highly concentrated market;
 2. discourage service investment by incumbent operators, who are likely to encounter capital constraints as a result of policy-driven licence conditions imposed through the current licensing process; and
 3. increase the cost to communicate where incumbents pass on the cost to their subscribers.

²³ Radio Frequency Spectrum Regulations, 2015

202. **SACF** adds that the Authority needs to be cognisant of the combined impact of the reserve prices, obligations and right sizing of the spectrum blocks on this objective. The reserve price should be high enough to deter frivolous parties and low enough to encourage the participation of entrants with sound business cases.
203. **Qualcomm** submits that in general, an auction mechanism with reasonable reserve prices is the most efficient approach to ensuring that spectrum is put to its highest-value use.

The Authority's response:

The methodology used in arriving at the set reserve prices is covered under spectrum valuation section of this document.

The reserve prices were set at a fair value but not at a trivial level in order to discourage frivolous bidding. The benefit is that a fair reserve price provides a wide margin for price discovery during the principal stage of the auction.

The low reserve prices may incentivise bidders to engage in *strategic demand reduction*, i.e. bidders bid for lower number of lots of spectrum than they really need in the hope that they would win less spectrum, but at a lower price. This would likely result in an *allocative efficiency* failure, i.e. spectrum does not get into the hands of those that value it the most.

The high reserve prices minimise allocative efficiency risks therefore reduces the scope for price discovery during the various rounds of the Auction. Furthermore, a high reserve price may discourage participation particularly from the weaker and/or smaller marginal players. It increases the risk of unsold spectrum as it may also preclude other possible users and uses of the spectrum through exclusion from the auction.

In summary, the Authority is of the view that reserve prices are at a level that is fair for the bands so that the spectrum can be acquired by those

who value it most without excluding weaker and/or smaller marginal players to partake in the Auction. The real price discovery of the spectrum will be realised during the Auction.

**CONSIDERATION OF THE POLICY ON HIGH DEMAND SPECTRUM AND
POLICY DIRECTION ON THE LICENSING OF A WIRELESS OPEN ACCESS
NETWORK ON 26 JULY 2019 IN THE GOVERNMENT GAZETTE NO. 42597
("the Policy")**

POLICY DIRECTION CONSIDERATION

1. The Minister published the Policy on High Demand Spectrum and Policy Direction on the Licensing of a Wireless Open Access Network on 26 July 2019 in the Government Gazette No. 42597 ("the Policy") for the Authority's consideration.
2. The Policy has three sections covering the Introduction, Policy On High Demand Spectrum and Policy Direction on the Licensing of a Wireless Open Access Network.
3. The Authority has considered the Policy and has produced this document in order to capture their analysis of the consideration of the policy.
4. This document focus on the second section of the Policy and any other relevant policy direction which has been tasked to the Licensing of the IMT Council Committee as per the table below.

POLICY ON HIGH DEMAND SPECTRUM	CONSIDERATION OF THE POLICY ON HIGH DEMAND SPECTRUM
<p>2.1.2 High demand spectrum may be assigned to a WOAN and the remaining high demand spectrum may be assigned to other electronic communications network service licensees, which spectrum assignment processes must commence simultaneously.</p>	<ol style="list-style-type: none"> 1. The Authority agrees that the WOAN should also be assigned High Demand Spectrum. This will make it the 5th National Credible Wholesale Player²⁴ in the ICT Sector in South Africa, and in the process stimulate competition which will hopefully lead to affordable services for consumers. 2. The Authority considered setting aside 80MHz of High Demand Spectrum for the WOAN, which is currently more than what other wholesale players hold in the market. 3. The Authority sees no reason, be it legally or administratively, as to why the licensing processes for the WOAN and the High Demand Spectrum (IMT) should not commence simultaneously. The processes may however not be concluded at the same time. The simultaneous commencement of the licensing processes has been marked by the publications of the ITA's on the same day.

²⁴ A licensee that controls access to its RAN and is capable of providing IMT services on a wholesale basis to roaming and MVNO customers, where the licensee's RAN is capable of serving more than 50% of the population in South Africa.

<p>2.1.3 Noting that some incumbent operators have already been assigned high demand spectrum and considering the wholesale open access obligations imposed on the WOAN, the Authority must consider the assignment of spectrum within the following principles:</p> <p>(a) On 700 MHz, to ensure preferential treatment of the WOAN;</p> <p>(b) On 800 MHz, to ensure preferential treatment of the WOAN; and</p> <p>(c) On 2600 MHz, to ensure preferential treatment of the WOAN.</p>	<ol style="list-style-type: none"> 1. The Authority understand preferential treatment to mean setting aside the High Demand Spectrum for the WOAN, without it having to bid for the spectrum. The Authority has considered setting aside the proposed bands to the WOAN and has made a decision to set aside 80 MHz for the WOAN. The 80 MHz is sufficient to enable the WOAN to compete effectively in the open market with other credible wholesale players. 2. For the sub-1GHz spectrum, the Authority will consider setting aside 2x10 MHz in the IMT700 band, and 60 MHz in the high capacity bands (1x30 MHz in IMT2600 and 1x30 MHz in the IMT3500). This was to ensure that WOAN is a credible 5th National Wholesale Player and enable it to compete effectively in the Market having sufficient coverage and capacity spectrum. 3. Despite the WOAN being regarded as a 5th Credible National Wholesale Player, the Authority also aimed to ensure the efficient use of the Spectrum by not assigning the WOAN more than what it may
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	<p>require. Case studies show that the concept of a WOAN has not been viable in other parts of the world, and as such, there is a potential substantial risk of stranded spectrum in the WOAN hence the Authority assigned an adequate portion of the IMT spectrum.</p>
<p>2.1.4 The assignment of high demand spectrum not reserved for assignment to the WOAN must ensure that the following policy objectives are achieved:</p> <p>(a) leasing of electronic communications networks and electronic communications facilities and provision of wholesale capacity to other licensees, including to the WOAN upon request, as soon as the WOAN is licenced. The Authority must perform strict regulatory oversight to ensure compliance with this network and facilities leasing requirement;</p> <p>(b) procurement of capacity in the WOAN as provided in paragraph 3.5(b)(iv)(paragraph 3.5(b)(iv): <i>offtake i.e. a minimum of 30% national capacity must be procured from the WOAN collectively as soon as the WOAN is operational, for a period of at least five years, by</i></p>	<p>1. <u>Network and Facilities Leasing Requirements:</u></p> <p>1.1. The Authority is in agreement with the proposed leasing requirements as Chapter 8 of the ECA makes provision for facilities leasing. In addition to this the Authority has developed Facilities Leasing Regulations in terms of section 44 of the ECA. This gives the Authority the power to perform regulatory oversight to ensure compliance with the facilities leasing requirement.</p> <p>1.2. The WOAN just like the other licence holders will be subjected to the Facilities Leasing Regulations.</p> <p>2. <u>30% uptake for the WOAN:</u></p> <p>2.1. The Authority is implementing the minimum 30% offtake obligation in support of the WOAN's viability.</p> <p>2.2. The incentive to the WOAN will be imposed to all successful applicants as licence terms and conditions in accordance with regulation 7(e) of the</p>

<p><i>radio frequency spectrum licensees that are assigned high demand spectrum through this licensing process. The percentage to be procured by each licensee may be proportionate to the amount of high demand spectrum assigned to such licensee);</i></p> <p>(c) universal access and universal service obligations to ensure high quality network availability in rural and under-served areas; the obligations must be complied with in rural and under-served areas before the assigned spectrum may be used in other areas bearing in mind practicalities such as the unsuitability of certain high band spectrum for rural areas;(d) a single entity may not control the spectrum; and(e) compliance with empowerment requirements.</p>	<p>Radio Frequency Spectrum Regulations, 2015 as amended.</p> <p>3. <u>Universal access and universal service obligations:</u></p> <p>3.1. Section 8 (2) (g) and (4) of the ECA makes reference to universal access and universal service obligations. The Authority is thus in agreement with the universal access and universal service obligations policy. The Authority is considering re-arranging the under-served areas into three Batches from the list contained in the Regulations developed in terms of section 8 (4) of the ECA (i.e. Universal access and universal service obligations regulations). The Sub-1GHz IMT Bands will be licensed with universal service and access obligations to ensure high quality network availability in rural and under-served areas since the propagation characteristics of that spectrum allows for larger cells which is ideal to cover the rural areas as well as in-door urban penetration. However, on the other high capacity bands this obligation will not apply.</p> <p>4. <u>Single entity may not control the spectrum:</u></p> <p>4.1. The Authority is in agreement with this policy directive because it will facilitate the competition within the ICT Sector.</p>
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	<p>5. <u>Compliance with empowerment requirements:</u></p> <p>5.1. The Authority is in agreement with this policy directive because regulation 7 (3) of the Radio Frequency Spectrum Regulations, 2015 (as amended) set out the empowerment requirements to be adhered to.</p>
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<p>3.1 The Authority is directed, in terms of section 3(2) read with section 5(6) of the ECA, to issue an Invitation to Apply (ITA) and accept and consider applications for an individual electronic communications network service licence for a WOAN. The WOAN is an important policy instrument to lower barriers to entry for smaller players, improve the ownership of the ICT sector by historically disadvantaged individuals and to promote service-based competition. The Authority should licence spectrum to the WOAN in a manner that enables it to fulfil its policy mandate and to thrive.</p>	<p>Section 5 (6) of the ECA states that <i>"the Authority may only accept and consider applications for individual electronic communications network services licences in terms of a policy direction issued by the Minister in terms of section 3."</i> The ECA is silent on the requirement by the Authority to regulate wholesale open access. The Authority has considered the policy directive and decided to issue an I-ECNS licence to provide WOAN services in accordance to the provisions of the ECA. To the extent that the WOAN would like to participate in the wholesale market (if any), then it will do so as a business opportunity in line with the provisions of the ECA. Insofar as spectrum is concerned, the Authority has provided as much spectrum (80MHz) as the current national wholesale operators have been assigned in order to maximise its chances of fulfilling its policy mandate while at the same time ensuring that the number of existing competitors is not reduced and that spectrum is efficiently utilised.</p>
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**COMPETITION ASSESSMENT TO INFORM THE LICENSING OF THE
INTERNATIONAL MOBILE TELECOMMUNICATION SPECTRUM ON THE ICT
SECTOR**

COMPETITION ASSESSMENT TO INFORM THE LICENSING OF THE INTERNATIONAL MOBILE TELECOMMUNICATION SPECTRUM ON THE ICT SECTOR

BACKGROUND

The Independent Communications Authority of South Africa ("the Authority") is to make available a large amount of spectrum of 406 MHz²⁵ for licensing for the provision of mobile broadband services in South Africa. Given the scarcity of spectrum, it is likely to be particularly important in shaping future competition in mobile markets in South Africa and the extent to which individual national²⁶ and/or sub-national²⁷ wholesalers are able to credibly compete with each other.

An important pre-requisite for the determination of fair economic value of the four bands and the spectrum auction itself is taking a view on the current state of competition as well as considering competition in mobile broadband markets in South Africa in the future.

²⁵ 80 MHz is set-aside for the licensing of the WOAN

²⁶ A licensee that controls access to its Radio Access Network (RAN) and is capable of providing IMT services on a wholesale basis to roaming and Mobile Virtual Network Operator (MVNO) customers, where the licensee's RAN is capable of serving more than 50% of the population in South Africa.

²⁷ A licensee that controls access to its RAN and is capable of providing IMT services on a wholesale basis to roaming and MVNO customers, where the licensee's RAN is capable of serving less than 50% of the population in South Africa.

Overview

- 1 In this section, the Authority considers competition pre- and post-auction. The Authority considered three types of competitors who provide mobile services:
 - national wholesaler;
 - sub-national radio access network ("RAN") operator; and
 - other retailers (including smaller ISPs and Mobile Virtual Network Operators ("MVNOs")).
- 2 The Authority envisages that all three types of competitors will operate in the retail mobile market in the future post-auction. These markets are currently being analysed by the Authority through its MBI²⁸ and were analysed in the Data Services Market Inquiry (DSMI²⁹) published in December 2019 by the Competition Commission.
- 3 The Authority adopts the term "**national wholesaler**" from the Ofcom 2012 Competition Assessment, to refer to a licensee that controls access to its RAN and is capable of providing IMT services on a wholesale basis to roaming and MVNO customers, where the licensee's RAN is capable of serving more than 50% of the population in South Africa. The Authority use this term rather than the more widely used "Mobile Network Operator" (MNO), since owners of sub-national RANs are also network operators, albeit on a much smaller scale. The Sub-National Wholesaler refers to a licensee that controls access to its RAN and is capable of providing IMT services on a wholesale basis to roaming and MVNO customers, where the licensee's RAN is capable of serving less than 50% of the population in South Africa.
- 4 Additionally, national wholesalers could share or contract for access to national RANs and still be in a position of controlling wholesale access, but not actually operating the network. National wholesalers supply access to their RANs to a variety of downstream retail operations, including MVNOs, operators of smaller sub-national

²⁸ Independent Communications Authority of South Africa Act, 2000 as amended (Act No. 13 of 2000): Discussion document on Mobile Broadband Services Inquiry, Government Notice No. 1560, published on 2 December 2019, National Gazette No. 42878, Vol. 654 ('The ICASA MBI discussion document').

²⁹ Competition Act, No. 89 of 1998 (as amended) ("the Act"): Completion of the Data Services Market Inquiry December 2019, Government Notice No. 1588, published on 6 December 2019, National Gazette No. 42891, Vol. 654 ('The Competition Commission DSMI report').

RANs and their own downstream retail operations. National wholesalers include, in this context, parties who are already actively supplying third parties in a wholesale market, and also those who have the ability to do so but choose not to, only supplying their own retail operation.

- 5 On the basis of the above definitions, this assessment suggests that there are currently the following competitors in the South African market:
 1. **National wholesalers Tiers:** There are four national wholesalers³⁰. In this competition assessment, the Authority uses the term "tier one operators" to refer to Wholesale National Operators³¹ that have a retail market share in excess of 45% in more than 10 municipalities and uses the terms "third national wholesaler" and "fourth national wholesaler", collectively 'tier-two operators'³² to refer to Wholesale National Operators that have a retail market share of below 45% in less than 10 municipalities.
 2. **Sub-national RAN operators:** Operators who own RANs but operate only in limited parts of South Africa³³.
 3. **Other retailers:** Any competitor who provides mobile services to consumers but is not a national wholesaler or a sub-national RAN operator. The main category of such competitors are MVNOs. The "other retailer" may manage certain functions itself (including signing up customers, billing and so on) or buy these services on a wholesale basis.
- 6 In the following section, the Authority first considers competition pre-auction, followed by a discussion on competition post-auction.

³⁰ Namely Vodacom, MTN, Cell C and Telkom Mobile

³¹ Vodacom and MTN

³² Cell C and Telkom Mobile

³³ Rain and Liquid Telecoms

Competition pre-auction

- 7 The Authority's discussion document on its MBI³⁴ and the Data Service Mobile Inquiry (DSMI)³⁵ of the Competition Commission both suggest that markets for mobile services are not serving consumers well.
- 8 In the following sections, the Authority considers barriers to entry, retail and wholesale market shares, retail prices as well as access and spectrum assignments pre-auction; in undertaking a competitive assessment of the market.

Barriers to entry

- 9 The preliminary finding of the Authority's MBI discussion document is that barriers to entry in markets for mobile broadband services in South Africa are high.
- 10 *Facilities based entry:* In respect of facilities-based entry, access to spectrum, sites and supplementary roaming are very high barriers. This is because of the nature of spectrum assignments, the expense of rolling out new sites, the relatively *limited extent of site sharing in South Africa*, and the high costs of national roaming. These barriers to entry contribute to the ineffective levels of competition in markets for mobile services in South Africa.
- 11 Barriers to entry and expansion include the substantial investments required in marketing and distribution networks.
- 12 In addition, there are legal barriers to entry in that an Individual Electronic Communications Network Service ("I-ECNS") licence is required in order to enter markets for mobile broadband services.
- 13 *Services based entry:* MVNO or Access Point Node (APN) accesses are required for services-based entry. At present, access at the services layer via APN or MVNO services are available only at high cost in the former case, and only one operator directly provides MVNO services.

Retail and wholesale market shares and market power

- 14 Two operators have a combined market share of almost 75% (see Figure 1), and the market is highly concentrated with an Herfindahl-Hirschman Index (HHI) of

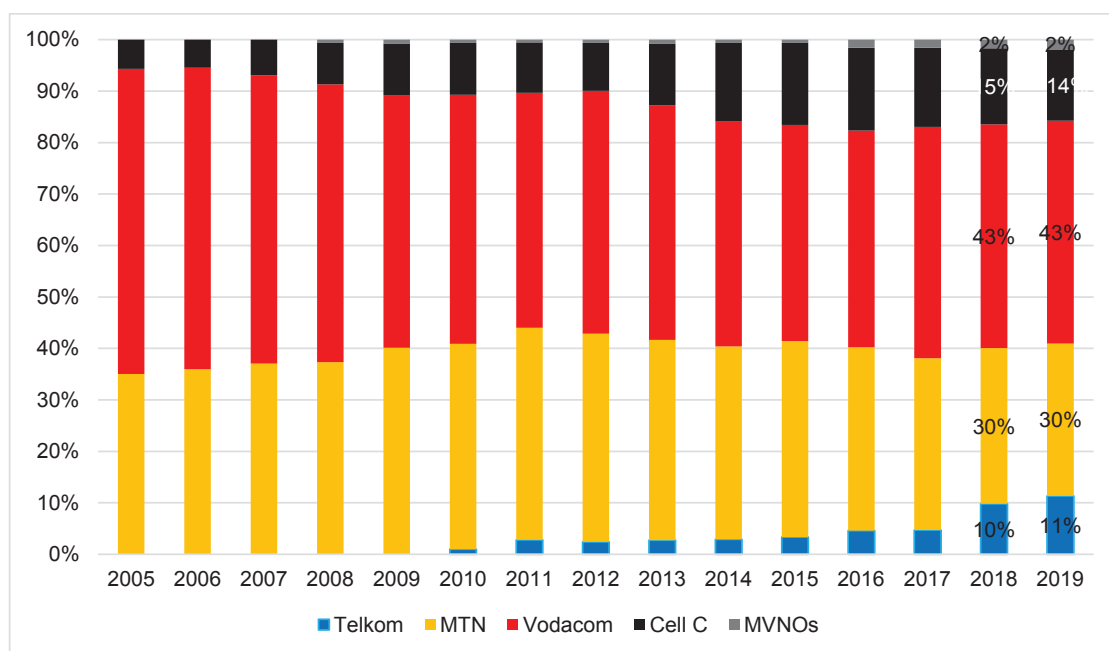
³⁴ Published in the Government Gazette No. 42878 (Notice No. 1560) on 02 December 2019

³⁵ Published in the Government Gazette No. 42891 (Notice No. 1588) on 06 December 2019

3,076. This is considered to be highly concentrated. For example, the US Department of Justice refers to markets with an HHI above 2,500³⁶ as highly concentrated, while the UK's Competition and Markets Authority refers to markets that have an HHI of above 2000 as highly concentrated.³⁷

15 The preliminary findings of the MBI indicate that there are high levels of concentration that vary between municipalities, where market shares are even higher in many cases (see Figure 2).

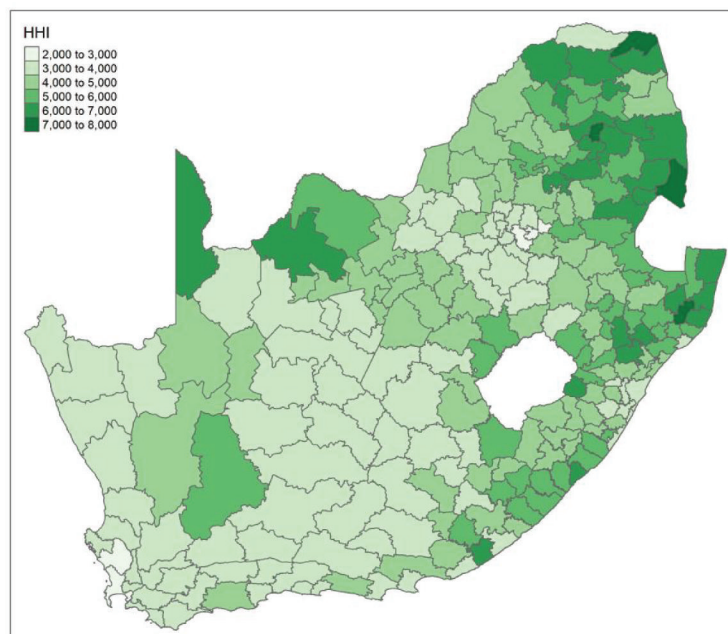
Figure 1: Market shares (connections, 2005 - 2019)



Source: Operator annual reports and disclosures

³⁶ See: <https://www.justice.gov/atr/horizontal-merger-guidelines-08192010#5c>

³⁷ See: https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/284449/OFT1254.pdf

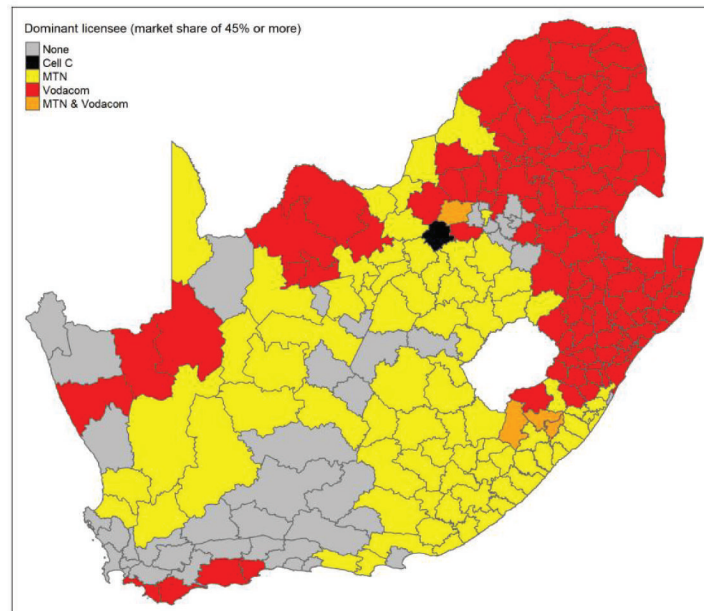
Figure 2: Herfindahl-Hirschman Index, by local and metropolitan municipality (retail)

Source: MBI discussion document

- 16 A number of licensees have significant market power in various municipalities, as measured using the dominance threshold applied in the Electronic Communications Act, 2005 (Act No. 36 of 2005) ("ECA") (a 45% market share)³⁸. Vodacom is dominant in 110 municipalities, MTN is dominant in 78 municipalities. MTN and Vodacom both have a share of 45% or more in 4 municipalities (see Figure 3). Cell C has a market share of 45% in one local municipality, and 41 municipalities do not have a dominant operator.

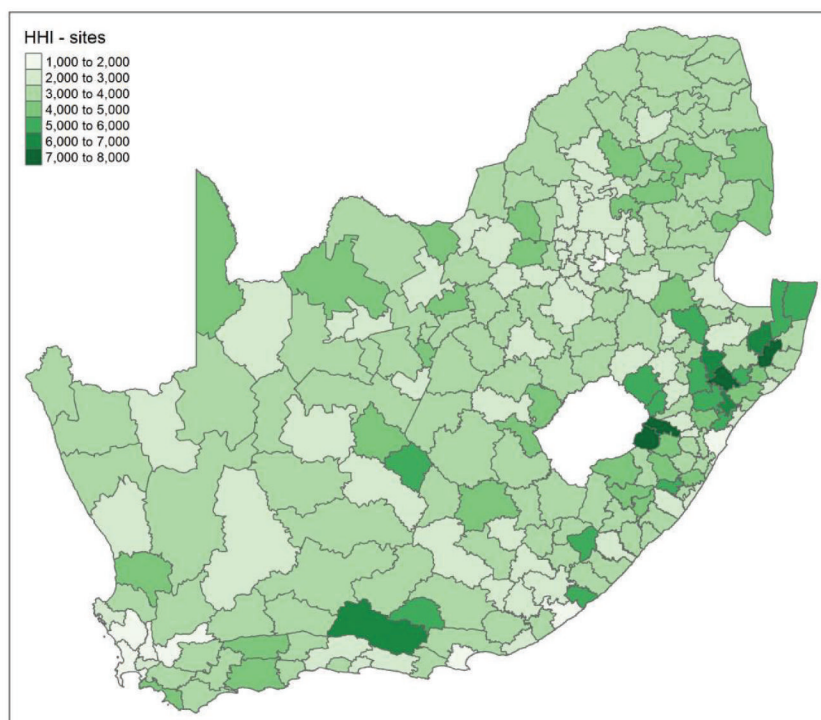
³⁸ Section 7 of the Competition Act no.89 of 1998

Figure 3: Dominant licensee (retail market share of 45% or more, by local and metropolitan municipality)



Source: MBI discussion document

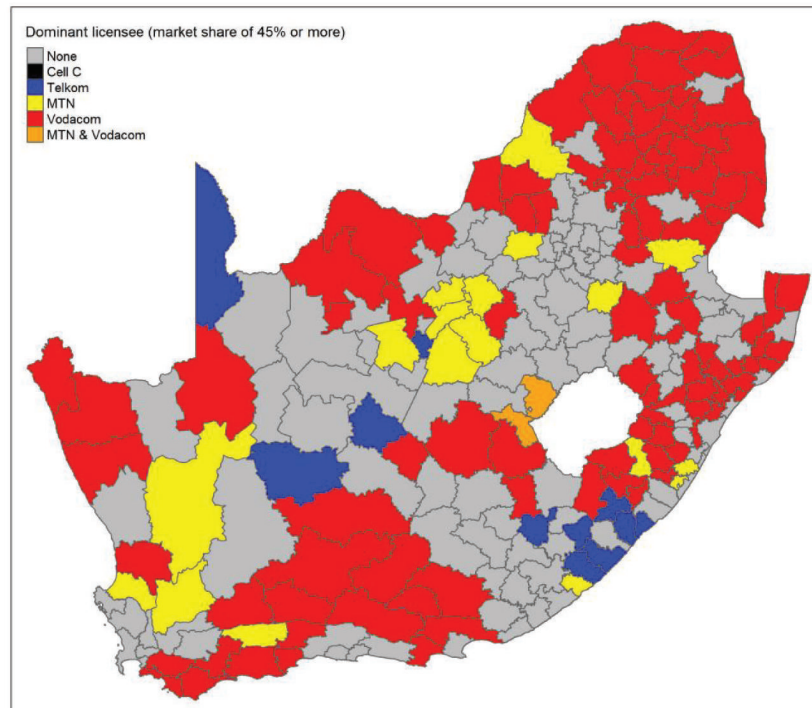
- 17 In addition, preliminary findings contained in the MBI suggest that the market for site access is extremely concentrated, with MTN and Vodacom together accounting for just under 70% of the market, and American Tower Corporation and other tower companies accounting for a further 14%. Cell C and Telkom *use relatively small numbers of Vodacom and MTN's sites*. The smaller operators are at an even bigger site disadvantage in non-metro areas.
- 18 When the owned sites are broken down into metro and non-metro areas, it appears that non-metro areas are even more concentrated. At the level of local municipalities, sites are even more concentrated. Markets are highly concentrated (have an HHI greater than 2000) in 226 out of 234 municipalities (see Figure 4).

Figure 4: HHI by local and metropolitan municipality for sites

Source: ICASA MBI discussion document. Note: Sites operated by non-MNO third parties were not obtained directly but taken from MNO submissions. Duplication across MNOs (where more than one MNO leases space on the same third party site) was eliminated using the latitudes and longitudes provided and an assumption that sites reported within 30m of one another are not unique sites but the same site which has been reported by two or more operators.

19 Furthermore, considering site market shares at the local and metropolitan municipality level, Vodacom, MTN and Telkom are dominant in a number of municipalities (Figure 5).

Figure 5: Dominance measured by site market shares in local and metropolitan municipalities



Source: ICASA MBI discussion document.

- 20 Retail and wholesale markets are linked. MTN and Vodacom are both vertically integrated since they operate downstream retail as well as upstream services, have been assigned spectrum, operate their own high sites and offer roaming services. A high degree of vertical integration may be harmful to competition and may give rise to significant market power at the wholesale and retail levels. Evidence of the fact that vertical integration is harmful to competition is the limited sharing of infrastructure³⁹ in South Africa and the very high costs of roaming. In particular, roaming prices are high compared to retail prices in South Africa, as well as compared to modelled costs.⁴⁰
- 21 In addition, there is a positive correlation between the level of concentration of ownership of mobile sites and retail customers in municipalities in South Africa (see Figure 6).⁴¹ Similarly, site market shares and customer market shares are highly

³⁹ See ICASA MBI discussion document, paragraph 37.

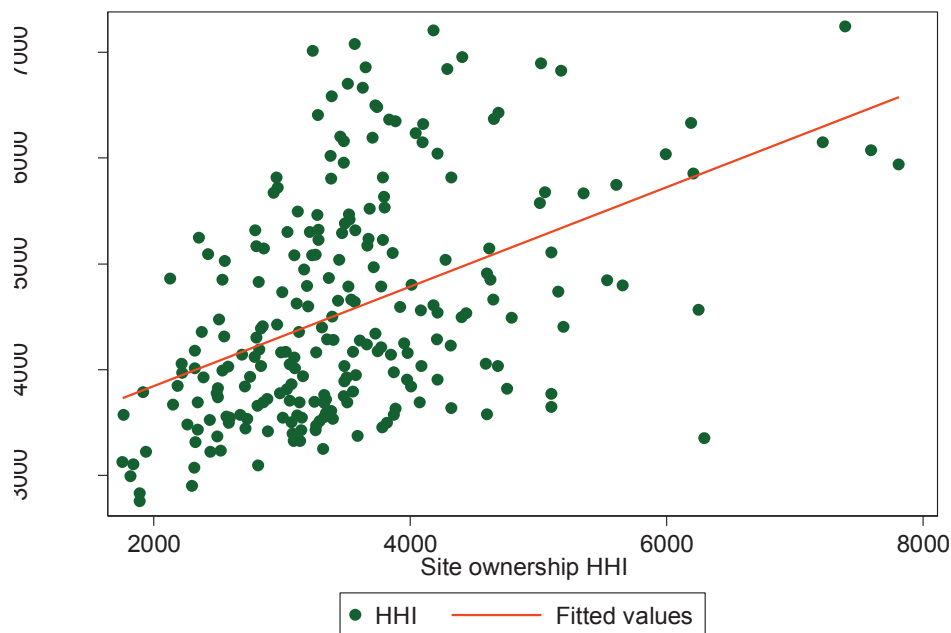
⁴⁰ See ICASA MBI discussion document, paragraph 164.

⁴¹ The correlation between site market concentration and customer market concentration (measured by the HHI) is 0.46, suggesting a link between wholesale and retail concentration.

correlated (see Figure 7).⁴² This suggests that the level of competition at the retail level is strongly linked to the level of competition at the wholesale level. There is therefore likely a strong link between market power at the wholesale and retail levels. In the South African market dominant positions in wholesale site access services are positively correlated with dominant positions at the retail level.⁴³

- 22 A further concern is the lack of supply of MVNO services by all of the national wholesale operators bar one (Cell C is the only one wholesale MVNO provider today). This leads to significant barriers to entry at the retail level, particularly as entrants require access to spectrum, sites and roaming services.

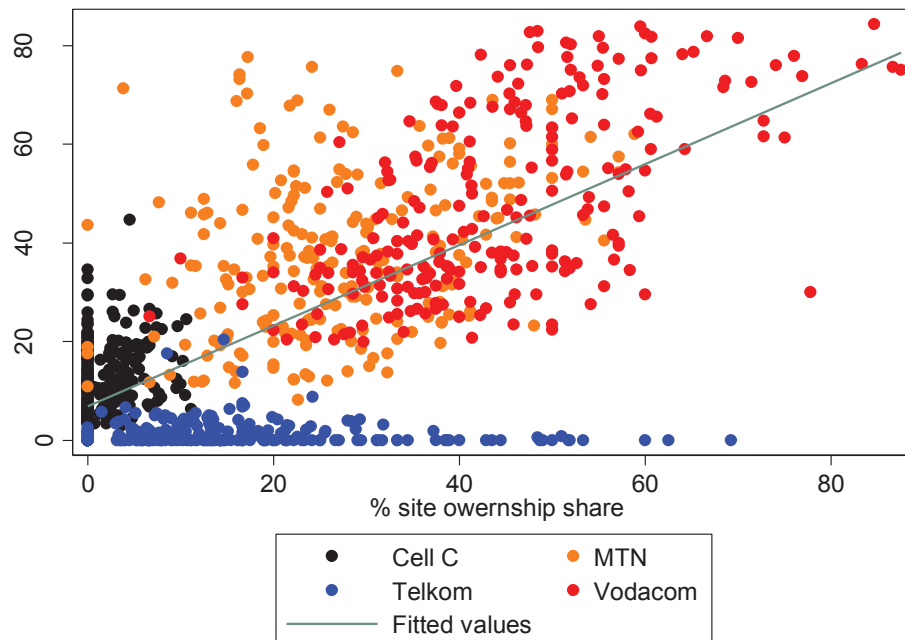
Figure 6: Relationship between concentration (HHI) at the wholesale (site) and retail (customer) levels, municipalities



⁴² The correlation between site market shares and customer market shares is 0.69, suggesting a strong positive link between wholesale and retail competition.

⁴³ The correlation coefficient between MTN's dominant position in markets for sites and customers is 0.4 while the correlation coefficient between Vodacom's dominant positions in markets for sites and customers is 0.68.

Figure 7: Relationship between wholesale (site) and retail (customer) market shares (at the operator and municipal level)



Retail price and access outcomes

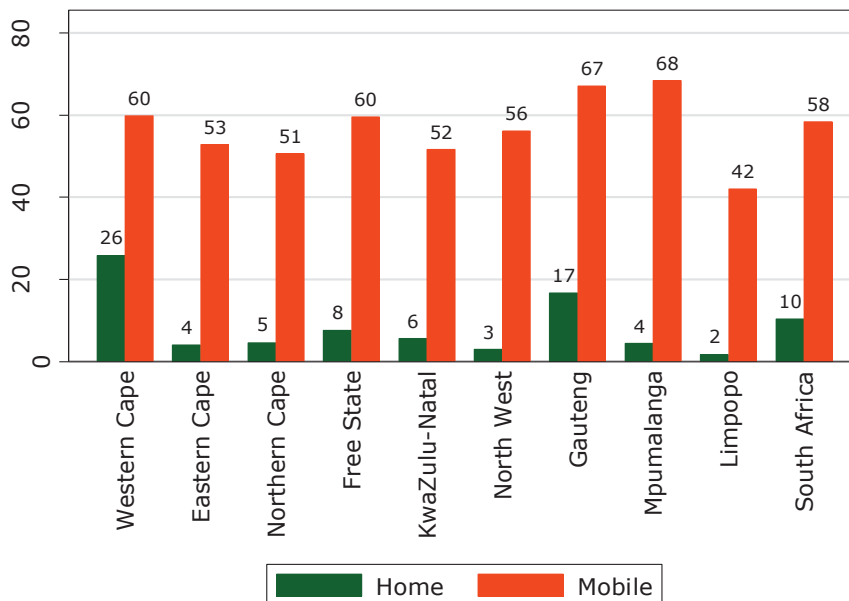
23 Broadband penetration is relatively low in South Africa. Based on the General Household Survey for 2018, approximately 64.7% of households in South Africa had at least one member who used the Internet either at home, work, at a place of study or Internet cafes, which has increased significantly from 32.9% in 2011.⁴⁴ Despite significant growth, the distribution of access has been uneven and many households remain without any access to internet (see Figure 8). Growth in the number of people that can access the internet is driven by the use of mobile phones which speaks to the importance of distributing additional spectrum to enhance (mobile) broadband service provision.

24 In most provinces other than Gauteng and the Western Cape, Internet access in households is at alarmingly low levels (below 10%) (see Figure 8). Internet access by at least one member of the household via mobile was also very low in the mainly rural provinces, including Limpopo (42%) and the Eastern Cape (53%).

⁴⁴ Statistics South Africa General Household Survey Report, 2011 and 2019.

- 25 While the lack of spectrum assignments likely plays an important role in these access outcomes, it is also likely that pricing and the high levels of concentration in the markets play a role.

Figure 8: Percentage of households with access to the Internet at home, or for which at least one member has access to, or used the Internet any place via a mobile cellular phone, by province, 2018



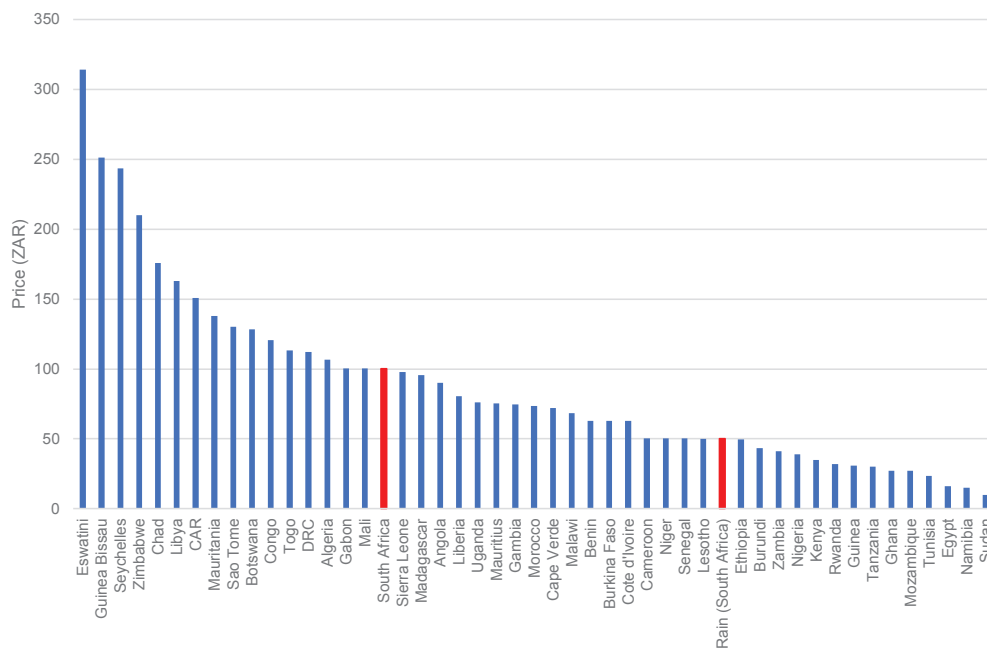
Source: Statistics South Africa, 2018, 'General Household Survey', available at: <http://www.statssa.gov.za/publications/P0318/P03182018.pdf>

- 26 A nuanced picture emerges from the international comparisons the Authority has conducted during the course of the MBI.⁴⁵ The analysis of mobile data prices has shown that South Africa's prices are neither extremely high nor very low in relation to other African countries (see Figure 9) or compared to countries which are similar to South Africa, in terms of their size and level of development (Figure 10).
- 27 When placed in further context with data on speeds (Figure 11) and LTE coverage (Figure 12), it is clear that customers in South Africa are benefiting from a much higher quality of access than those in other African countries. With regards to the International Telecommunications Union's ("ITU") "Advanced" countries, South Africa performs reasonably well and its performance (in terms of price and quality) is similar to a number of countries that would be considered its peers (Brazil, Peru, Mexico, Thailand, Malaysia). However, this analysis also indicates some degree of

⁴⁵ See ICASA MBI discussion document, paragraph 67.

possible market failure given that some countries, notably China, out-perform South Africa on both price and quality.

Figure 9: Price for a 1GB bundle (USD): Africa, Q1 2019



Source: Research ICT Africa (2019). Available [here](#).

Figure 10: a 500MB bundle (USD PPP) (2016) vs download speed (2017): BRICS and ITU "Advanced" countries

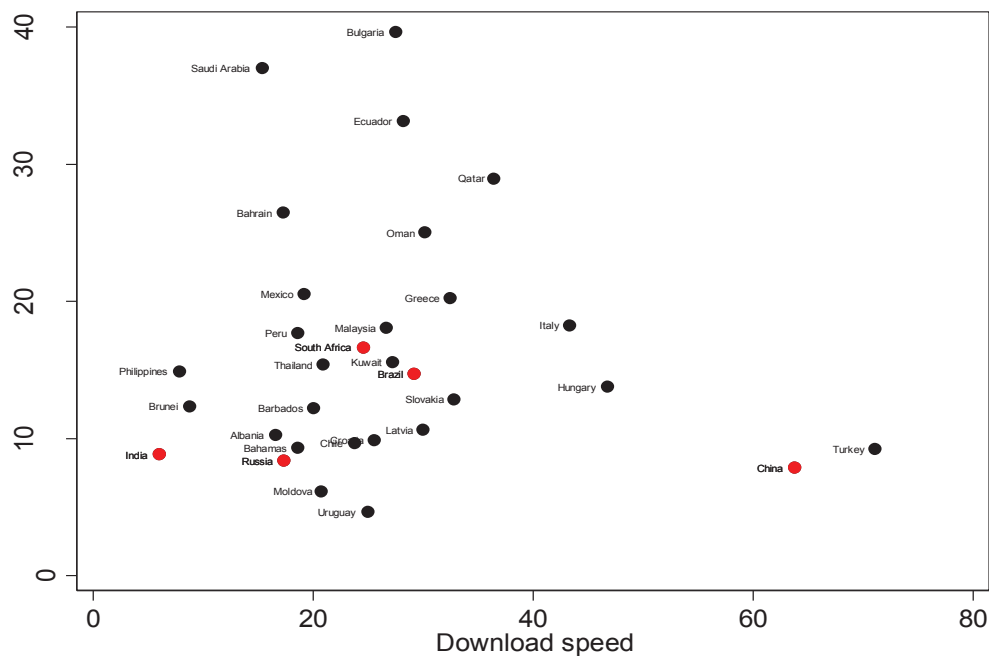
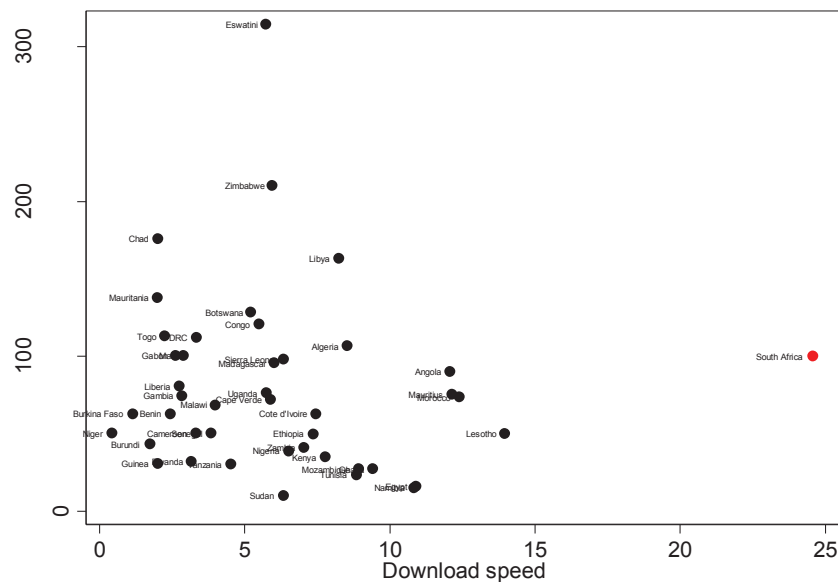
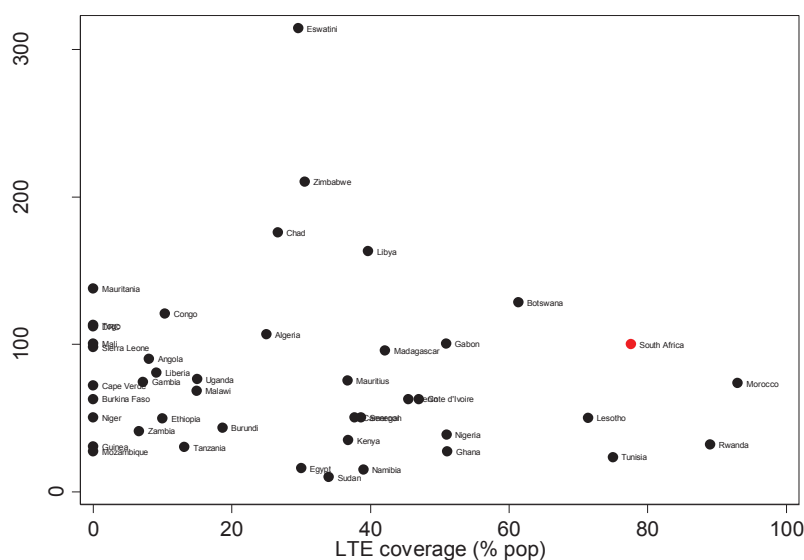


Figure 11: Price for a 1GB bundle (USD) (Q1 2019) vs download speed (2017): Africa



Source: Research ICT Africa (2019), available here; Ookla speed data sourced from GSMA (2018), available here

Figure 12: Price for a 1GB bundle (USD) (Q1 2019) vs LTE coverage (% of population) (2017): Africa



Source: Research ICT Africa (2019), available [here](#); coverage data from GSMA (2018), available [here](#).

Spectrum assignments pre-auction

28 Spectrum assignments used for mobile and fixed-wireless broadband are shown in Table 1. Vodacom, MTN and Cell C all have relatively similar assignments of approximately 80MHz each currently including assignments in the 900MHz, 1,800MHz and 2,100MHz bands. Telkom is in a slightly different position, with no sub-1GHz spectrum but assignments in the 2,300MHz (unpaired) and 3,500MHz bands.

Table 1: Current high-demand spectrum assignments and spectrum available for the auction

Band	Operator	Total Bandwidth (MHz)	Available for auction
700 MHz ⁴⁶	Available		2x20
800 MHz ⁴⁷	Available		2 x 30
850 MHz	Liquid Telecom	10 (2x5)	
900MHz	Cell C	22 (2x 11)	
	Vodacom	22 (2x 11)	

⁴⁶ 713 -733MHz paired with 768 -788 MHz

⁴⁷ 791-821 MHz paired with 832 -862 MHz

Band	Operator	Total Bandwidth (MHz)	Available for auction
1800 MHz	MTN	22 (2x 11)	
	Cell C	24 (2x 12)	
	Vodacom	24 (2x 12)	
	MTN	24 (2x 12)	
	Liquid Telecom	24 (2x 12)	
	Telkom	24 (2x 12)	
2100 MHz	Rain	34 (2x 12) + (1x 10)	
	Cell C	30 (2x 15)	
	Vodacom	35 (2x 15) + (1x 5)	
	MTN	40 (2x 15) + (1x 10)	
2300 MHz	Telkom	30 (2x 15)	
2600 MHz ⁴⁸	Rain	60 (1 x 60)	140 (1 x 140)
3500 MHz ⁴⁹	Liquid Telecom	20 (1x 20)	86 (1 x 86)
	Telkom	56 (1x 56)	
3700 MHz ⁵⁰	Rain	28 (1x 28)	
Total		80 (1x 80)	326 ⁵¹

29 Table 2 illustrates the spectrum assignments of the operators and figure 1 illustrated the market shares by connections of four wholesale national operators. Table 2 together with Figure 1 clearly illustrates that given the number of subscribers on each network, Vodacom and MTN are more spectrum constrained than the other two operators.

Table 2: Assignment by operator

Operator	900	1800	2100	2300	2600	3500	3700	Total
Vodacom	22 (2 x 11)	24 (2 x 12)	35 (2 x 15) + (1 x 5)					81
MTN	22 (2 x 11)	24 (2 x 12)	40 (2 x 15) + (1 x 10)					86
Cell C	22 (2 x 11)	24 (2 x 12)	30 (2 x 15)					76
Telkom		24 (2x 12)	30 (2 x 15)	60 (1 x 60)		28 (1x28)		142
Rain		34 (2x 12) +			20 (1x20)*		80 (1x80) ⁵²	134 [54]

⁴⁸ 2530 -2575 MHz and 2595-2690 MHz

⁴⁹ 3458 -3544 MHz

⁵⁰ This is the Access Spectrum not the IMT Spectrum

⁵¹ 80 MHz of the 406 MHz has been set-aside for the licensing of the WOAN

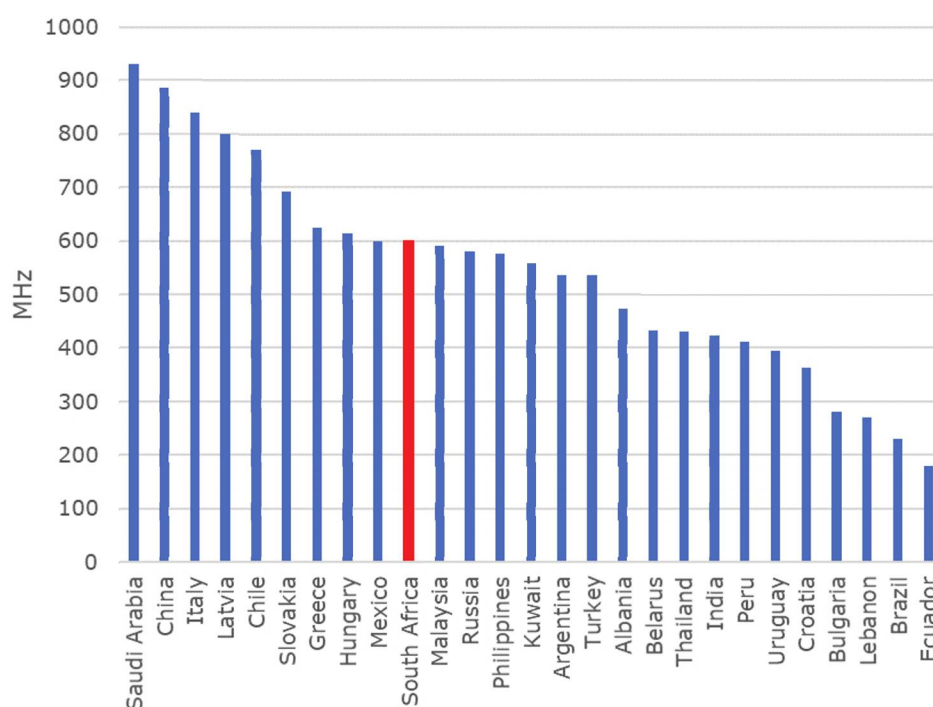
⁵² This is the Access Spectrum not the IMT Spectrum

Operator	900	1800	2100	2300	2600	3500	3700	Total
		(1x 10)						
Liquid Telecom	10 (2x5) (850MHz)	24 (2x12)				56 (1x56)		90
Total								609

30 Thus, the current spectrum assignments are reasonably balanced among the four MNOs offering nationwide service, except for Telkom's lack of sub-1GHz spectrum. At the same time, Telkom has significantly higher assignments of spectrum overall.

31 Figure 13 illustrates the spectrum assignments of the BRICS countries and the countries classified as "Advanced" by the ITU. China's much better performance in terms of speed and price (Figure) is put in context when seen alongside the fact that it has assigned nearly twice the spectrum that South Africa has. **These comparisons do not prove a causal link between spectrum assignments and prices. Nonetheless, the data highlights that South Africa's spectrum assignments are relatively low overall, and that more spectrum needs to be assigned urgently in order to enable cheap, high quality mobile broadband.**

Figure 13: Assignment of mobile spectrum in BRICS and ITU "Advanced" countries



Source: <https://www.spectrummonitoring.com/> and regulator websites

- 32 The forthcoming spectrum auction is not expected to solve the above wholesale and retail competition concerns in South Africa. However, the Authority is keenly aware of the need to prevent the auction award from worsening the competition concerns in mobile markets identified by the Authority. This is done by imposing appropriate obligations and spectrum caps prescribed in the ITA and described in detail in Competition Post-auction section of this document.

Competition post-auction

Overview

- 33 In this section, the Authority discusses potential post-auction market outcomes that take into account the analysis of competition set out above. The view on potential market outcomes impact on factors such as the spectrum that is set aside for various competitors such as the Wireless Open Access Network ("WOAN").
- 34 The Authority recognises the weaknesses in competition at the retail level in mobile markets in South Africa – particularly with respect to high levels of concentration (with Tier 1 National Wholesale Operators collectively having a market share of more than 75%) and the low level of uptake, as discussed above. A spectrum award process would in the short to medium term influence competition at the wholesale level more significantly. Spectrum would typically (but not exclusively) be won by the wholesale national players. However, downstream retail competition will still be affected.
- 35 Access to spectrum is a key input to the provision of mobile services given that spectrum, particularly low frequency sub-1GHz frequencies most suited to the efficient provision of wider coverage mobile broadband services, is a finite resource. As such, access to such spectrum can have a significant impact on the nature of wholesale competition in the market, and the services that can be offered.
- 36 This spectrum award will make available a large amount of spectrum suitable for the provision of mobile broadband services (both low frequency spectrum for coverage and higher frequency spectrum for capacity). Some 406 MHz of spectrum would be awarded by the close of this process to operators including to the proposed new WOAN. Given the scarcity of sub-1GHz spectrum in South Africa (no 700MHz and 800MHz spectrum has been assigned to date), it is likely to be particularly important in shaping future competition in mobile markets, and the extent to which individual national wholesalers are able to compete **credibly** with each other. Hence, the competition assessment points to attracting some sub-1GHz spectrum for the weaker and/or smaller third/fourth tier-2 national wholesalers.
- 37 As a general proposition, the Authority considers that competition between more rather than fewer competitors is likely to be the most effective means of enhancing competition, particularly in a concentrated market with high barriers to entry like

those mentioned above in South Africa. Given that in mobile markets operators need access to spectrum to be able to compete as national wholesalers, the Authority has considered the minimum number of national wholesalers to promote for purposes of this forthcoming spectrum award.

- 38 The Authority would be concerned if as a result of this award, less operators had access to sufficient spectrum to compete credibly at the wholesale level (outside the WOAN) in the future than is currently the case in South Africa (i.e. four), as this could lead to a reduction in competition⁵³, which is not aligned with the aims of the ECA.
- 39 The Authority has taken clear cognisance of Government's Policies and comments by stakeholders in response to the Authority's Information Memorandum (IM) Notice of 01 November 2019 for the Authority to make provisions for a WOAN entrant and as such spectrum has been reserved for the WOAN.
- 40 However, the manner in which the WOAN is conceptualised is important. The Authority has taken a view that WOAN is a new entrant and may become the fifth (5th) credible national wholesaler (in addition to the four national wholesalers).
- 41 The Authority considered the following spectrum to be set-aside for the Licensing of the I-ECNS Licence for the provisioning of the WOAN:
1. a maximum of 2 x 10 MHz of the sub-1GHz (IMT700), (i.e. 16.6% of the sub-1GHz total available IMT Spectrum for Licensing).
 2. 1 x 30 MHz of very valuable IMT2600 spectrum for the WOAN (i.e. 17.6% of the IMT2600 available IMT Spectrum for Licensing).
 3. 1 x 30MHz of IMT3500 (i.e. 25.9% of the IMT3500 available IMT Spectrum for Licensing).
- 42 The Authority believes that the portfolio for the WOAN provides enough capacity and coverage spectrum (80MHz in total) for the WOAN to be a **credible** new wholesale national entrant into the mobile market alongside the existing four national wholesalers. The minimum 80 MHz of total spectrum is similar to the amount of spectrum each of the top three wholesalers currently hold prior to this

⁵³ It should be noted that we are not concerned with the identity of the competitors in the market: our intention is to promote competition, rather than to protect individual competitors.

licensing process to be followed by projected 2021 auction. The minimum of 80MHz for the WOAN is also consistent with all the options in the IM published on 01 of November 2019.

- 43 There could be greater benefits to consumers and citizens through increased competitive intensity if there are more than five national wholesalers. However, this would also carry a greater risk of inefficiency given the large number of customers served by the two largest wholesale national operators/licensees (see Figure 1). In addition, the Authority has not seen any clear unequivocal evidence of interest from stakeholders in becoming a credible, fifth national wholesaler though this could emerge later. **Given the entrenched duopoly structure of the retail market and taking the relative scarcity of the high demand sub-1GHz spectrum into account, the Authority does not consider that it would be objectively justified and proportionate to seek to actively promote more than five national wholesalers (including the WOAN).**
- 44 However, the spectrum portfolios for sub-1GHz to attract the third and fourth wholesale national operators as well as reservations for the WOAN - and the imposed spectrum caps on the top two wholesale national operators - would likely still allow for perhaps up to 2x10MHz of sub-1GHz spectrum to be won by a potential 6th or 7th wholesale national operator. Such a potential 6th or 7th wholesale national operator could combine this spectrum with their mid-band spectrum to be a credible player in the medium to long term. For the Authority to enhance competition through this award, the Authority should, subject to proportionality, take the minimum measures necessary to ensure that at least five wholesale network operators (including the new WOAN entrant) have access to spectrum to enable them to be capable of being credible national competitors at the wholesale level after the auction.
- 45 The Authority notes in this context that further consolidation between existing operators (whether by merger or co-operative joint venture) could take place in the future, and any such proposed consolidation would have to be considered by the Authority and the relevant competition authorities. **The Authority's intention is to avoid the effects of consolidation (i.e. a reduction in the current number of competitors) arising as a result of our decisions to make further spectrum available to the market.** A further measure in this regard is to ensure that coverage obligations in excess of 95% are only imposed on tier 1 operators

who are likely to be able to achieve them, rather than on tier 2 operators or sub-national operators who may never be in a position to achieve them.

- 46 An additional measure is to ensure that throughput requirements are reasonable. Based on the work carried out by the other regulators, the Authority decided that the downlink single user throughput of 5 Mbps, at the edge of the cell, shall be used as a coverage requirement. The Authority derived this value by considering the average throughput value used as the coverage obligation by 17 European regulators.⁵⁴
- 47 This recommendation is to use the coverage obligation for the sub 1 GHz spectrum bands i.e. IMT700 and IMT800 MHz bands. This is because the mobile operators usually use the higher spectrum bands such as IMT2600 MHz or IMT3500 MHz bands for capacity purposes. Therefore, these spectrum bands are not likely to be used in all sites. Note that the coverage obligation should be achievable on every single cell within the percentage of the population that requires coverage.
- 48 This is also applicable to the cells in most rural and challenging areas. Therefore, the value has to be realistic given the status of the mobile networks in South Africa. Note that the coverage obligation imposed by Ofcom in the UK for the 800 MHz band was to *deploy an electronic communications network that is capable of providing mobile telecommunications services with a sustained downlink speed of not less than 2 Mbps with a 90% probability of indoor reception to an area within which at least 95% of the UK population lives*.⁵⁵ Further, an uplink requirement is not typically imposed, as a fast uplink throughput is usually needed to maintain a fast downlink throughput.
- 49 Coverage refers to the proportion of the population that is able to receive a service with the minimum throughput required to maintain a minimum service level. The coverage corresponding to a single user can be measured when the network is lightly loaded.⁵⁶ The initial target of new technology deployed in mobile networks is to provide coverage to users so that the services are accessible to a large proportion of population. After coverage, then arguably it is the 'minimum' or 'average'

⁵⁴ See: <https://www.ecodocdb.dk/download/59a0f2f2-668b/ECCREP231.PDF>

⁵⁵ 4G Coverage Obligation Notice of Compliance Verification Methodology, Statement published by Ofcom on 24 November 2017, https://www.ofcom.org.uk/data/assets/pdf_file/0020/108209/4g-coverage-methodology.pdf

⁵⁶ Lightly loaded network is defined as the common channels only are transmitting at 22% of the maximum cell power, https://www.ofcom.org.uk/data/assets/pdf_file/0020/108209/4g-coverage-methodology.pdf

throughput that matters most to a Mobile Broadband customer rather than network capacity or even headline peak speeds. However, average throughput does not guarantee every user having a minimum level of service level. Therefore, regulators usually refer to single user throughput to measure the level of coverage. Clearly user throughput, network capacity and achievable peak speeds are all inter-related.

- 50 The Assessment considers that 5 Mbps throughput obligation at the edge of the cell is reasonable in light of the objectives set out in the ECA⁵⁷. It is the Authority's view that the said obligation is also consistent with the economic analysis/inquiries that has been carried out in relation to this point in the context of the MBI and the Competition Commission's data services market inquiry – and the previous ITA consultations.
- 51 Next, the Authority explains its view that a national wholesaler needs to be capable of being credible in order for public policy objectives to be achieved.

Credibility

- 52 The Authority recognises that the intensity of competition overall will depend on a range of factors including the relative strength of national wholesaler competitors and barriers to entry, and not simply on the number of competitors. However, as a matter of principle, the Authority's basic proposition is that competition is likely to be more intense, and hence more beneficial for citizens and consumers, with more rather than less competitors, provided they are credible competitors to each other.
- 53 As in the Ofcom 2012 UK Competition Assessment of Mobile Markets, by "credible", the Authority means that a competitor should be capable of exerting an effective constraint on its rivals, in terms of factors such as the provision of high-quality services, competitive prices, choice and innovation, and as such contribute to the overall competitiveness of the mobile market.
- 54 Given the complex and multi-faceted nature of mobile services, consumer demand, technology, and the characteristics of different spectrum holdings, there is in the Authority's view no single way to determine whether a national wholesaler, including the proposed new WOAN entrant, may be capable of being a credible competitor.

⁵⁷ Section 2 (c).

- 55 A national wholesaler could be a credible competitor even though it is not in a strong position in some dimensions of service (e.g. quality of coverage), or in delivering particular services (e.g. voice) or to particular customers (e.g. enterprise customers). For example, a national wholesaler might be credible if it were able to provide good quality of service (such as high data rates and latency) in most indoor locations, even if it could not compete as strongly for customers that particularly valued having a connection in the most difficult to serve locations.
- 56 While competitive differentiation may therefore have some benefits, the Authority considers that consumers currently benefit from competition across a wide range of services. In addition to the primary concern of this Assessment, the award may result in less credible national wholesalers, the Authority therefore also has a lesser concern that even if there were at least four credible national wholesalers, the spectrum holdings of one or more of them could mean they were at a disadvantage in competing across a wide range of services and customers. For example, a national wholesaler (e.g. the WOAN) without sub-1 GHz spectrum may be at a disadvantage in serving customers who have a strong demand for deep indoor coverage.
- 57 Consequently, the Authority has adapted Ofcom UK's 2012 broad analytical framework to assess the spectrum that a national wholesaler is likely to need to be capable of being a credible national wholesaler. Determining whether or not a particular national wholesaler is likely to be credible is ultimately an exercise of the regulatory judgement in light of the evidence.

Framework for how dimensions of quality can affect credibility

- 58 Ofcom's 2012 Competition Assessment provides a summary of conclusions on dimensions of capability and credibility that the Authority believe are most relevant to the future proposed WOAN as well as the third and fourth national wholesalers ('tier 2 operators') in South Africa in order to enhance competition.

Table 3: Summary of conclusions on dimensions of capability and credibility

Quality dimension	Necessary condition for credibility?	Importance for helping provide sufficient capability for credibility?
Capacity and average data rates	Essential: Necessary to have sufficient capacity to deliver a competitive average data rate and there is a material risk of not achieving this if holding less than 10-15% of vital capacity spectrum after auction, e.g. 2.6GHz and 2.3GHz.	Greater spectrum share than 10-15% is an advantage and a much larger holding than this is an important capability strength. Hence the reservation proposals in the portfolios for the WOAN, and for the 3 rd and 4 th national wholesalers.
Quality of coverage	Essential: Necessary to have sufficient quality of coverage and material risk if do not hold Sub 1 GHz spectrum is vital for coverage in South Africa	While not fully invaluable, sub 1 GHz spectrum gives an important capability strength and so makes a major contribution to being credible. The 3 rd and 4 th wholesale operators and the WOAN need sub-1GHz spectrum to be credible.
Minimum coverage and minimum average data rates	Essential: In addition to above two quality dimensions, there is a further material risk in South Africa if some players do not hold minimum block size of sub 1GHz spectrum and/or capacity spectrum, e.g. 2.6GHz or 2.3GHz	It is not just a matter of having sub 1 GHz spectrum to achieve an important capability strength to being credible, but the minimum is important. Particularly, the 3 rd and 4 th wholesale operators and the WOAN need a minimum sufficient sub-1GHz and mid-band

Quality dimension	Necessary condition for credibility?	Importance for helping provide sufficient capability for credibility?
		(2.6GHz, 2.3GHz, 3.5GHz) spectrum to be credible. The Authority's modelling of the South African situation has led it to propose minimum spectrum blocks for these weaker players.
Highest peak data rates	Not Essential: Unlikely to be necessary to deliver highest peak data rates for credibility. So unlikely that access to 2x20 MHz of sub-1GHz spectrum is necessary to be credible.	Ability to deliver high peak data rates may be a source of capability strength and differentiation, but in South Africa, it is not necessarily an important contribution to competing credibility.
Other IMT advantages (e.g. better latency, M2M, enhanced mobile broadband)	Unclear: Unclear that an early route to IMT spectrum bands to be licensed is necessary at this stage in 2020 in order to be credible because of other IMT Advance advantages, such as better latency.	Other IMT advantages may be a source of capability strength, but it is unclear how important it is as a contribution to credibility. Longer term, the importance of this strength is likely to grow for all the spectrum bands to be licensed in this process.

Source: Ofcom UK (2012) – Adapted for South Africa

59 A further consideration is the ability for Tier-2 national wholesalers and any sub-national operators to compete effectively post auction. As discussed above, there are very high levels of concentration in respect of site ownership. Furthermore,

there are only two Tier-1 wholesale national operators capable of providing roaming on a near full-coverage, national basis.

- 60 In order to ensure that Tier-2 national wholesalers and any sub-national operators are able to compete effectively post-auction, the Authority provides for measures to ensure that Tier-1 operators provide reference offers for site access. This will address anti-competitive behaviour in relation to facilities and spectrum sharing.

Assessment of economic evidence in support of a policy to promote at least four (+ one) national wholesalers

- 61 There are high barriers to entry in national wholesale mobile services/markets, namely (i) the requirements to gain control of appropriate spectrum rights (which are scarce), (ii) a RAN and (iii) access to physical sites. These barriers highlight the risks to competitiveness in wholesale mobile services if the auction were to lead to a reduction in the number of credible national wholesalers from four to three.
- 62 As such, some of the issues raised earlier are similar to those which are typically considered in the context of an assessment of the likely competitive effects of a concentration brought about by a merger. The Authority has considered some of same types of economic assessment as a merger control authority might do when looking at a merger in order to check that they are consistent with the Authority's principles.
- 63 In doing so, the Authority notes that such assessment methods form part only of its overall assessment, because the Authority's context here (a competition assessment exercise) is different to that of a merger. The Authority is not assessing a merger situation which are typically considered under the specific mergers' and acquisition legislation framework. The Authority's assessment therefore has a **broader scope** than a typical merger assessment, as it must take into account the Authority's role, objectives and policy aims as the sectoral regulator and the legal implications thereof.
- 64 Further, unlike in a merger assessment, the Authority had to consider the effects of the release into the market of a new and key strategic asset (spectrum) that could change the market structure and is expected to be used for new technologies, and potentially to offer new services to consumers.

- 65 The timeframe for this competition assessment is 5 to 10 years from the conclusion of the auction, which is significantly further into the future than is typically the case in mergers and acquisition assessment. Also, unlike a merger involving two identified merging entities, there is a greater degree of uncertainty as to the impact of the auction: for example, it is unclear which specific national wholesaler (if any) might exit, who might benefit and to what extent, and the timescales involved. These considerations put some limits on the extent to which merger control types of analyses can usefully be undertaken.
- 66 Nevertheless, there are some similarities in terms of the underlying economic issues, which both concern an increase in market concentration. As such, like with Ofcom UK (2012), the Authority believes it is helpful to make use of the tools of merger assessment where appropriate. Therefore, in seeking to check consistency with policy position, the Authority has considered the following factors: (a) the increase in market concentration; (b) the scope for firms unilaterally to raise prices or reduce quality; (c) the scope for coordinated behaviour between firms; (d) the extent of barriers to entering the market; (e) whether buyers have countervailing bargaining power and (f) whether the consolidation would give rise to greater efficiencies, which would be passed on to consumers e.g. in lower prices.
- 67 The Authority considered each of these factors in turn, in relation to provision of mobile broadband services in South Africa:
1. *The increase in market concentration:* The present mobile market in South Africa is already highly concentrated at 3,067 according to standard classifications.⁵⁸ A consolidation from four to three, e.g. from the exit of any of the Tier 2 national wholesalers would increase the HHI by a minimum of circa 400 points, well above 150 points which is the threshold for potential competition concern in merger control in highly concentrated markets. This justifies some spectrum portfolios to attract third and fourth national wholesalers to help mitigate such a risk. The introduction of a WOAN is likely to reduce the market concentration. This provides a strong justification for sufficient spectrum reservation for the WOAN in terms of coverage and capacity spectrum.

⁵⁸ The Herfindahl-Hirschman Index (HHI), a measure of market concentration, is calculated by adding together the squared values of the percentage market shares of all firms in the market (in this case we have used the shares of mobile subscribers). A value of the HHI above 2,000 is taken to be highly concentrated – see CMA (UK) Merger Assessment Guidelines. In this case, the HHI is well above 2,000.

2. *The scope for firms unilaterally to raise prices or reduce quality:* the Competition Commission found that “these two operators⁵⁹ are to a large extent able to price independently of the challenger networks”. In the context of a market with high barriers to entry, with the removal of a competitor, customers have fewer options. In the absence of offsetting effects, they are therefore less likely to switch in response to a price increase. Even in the absence of coordination firms will tend to charge higher prices in a more concentrated market. Unilateral effects will tend to be greater with a larger increase in concentration. They will also depend on how many (and to what extent) customers of the acquiring firm, and other remaining firms, saw the exiting/acquired firm as a close substitute,⁶⁰ and on whether the consolidation would involve the removal of a firm that was a strong competitive force.
3. *The scope for coordinated behaviour:* This will depend on factors such as the ability of firms to reach a (possibly tacit) coordinated agreement, their ability to monitor and punish cheating on such an agreement, and the presence or otherwise of an effective competitive fringe. With a dominant duopoly largely impervious to challengers’ activities, there is arguably some increased risk of co-ordinated behaviour from a reduction in the number of competitors and the risk of such an outcome has to be mitigated.
4. *Entry barriers:* A market with very low entry barriers could be competitive with only one provider. However, entry as a national wholesaler is subject to high entry barriers, including infrastructure costs, access to sites and the limited availability of spectrum. This speaks to the challenges of a new entrant WOAN – hence the reservations of some spectrum for the WOAN in addition to site access and roaming remedies.
5. *Countervailing buyer power:* i.e. customers being able to bargain down prices by threatening to buy less or switch to another supplier. Whilst the MVNOs hosted by one Operator may have some scope to bargain down prices by threatening to switch wholesalers, this depends on a competitive wholesale market. **According to the preliminary findings on the MBI, in South Africa, it appears not to be that competitive as the duopoly Tier 1**

⁵⁹ Vodacom and MTN

⁶⁰ So an increase in differentiation between firms could tend to lead to higher prices.

operators currently do not host MVNOs. Individual retail consumers are unlikely to have buyer power.

6. *Any efficiency benefits that may arise:* The UK Competition and Market Authority Guidelines consider a range of potential efficiencies from mergers, of which economies of scale appear most relevant. If the consolidation would allow firms to achieve greater economies of scale, and if these savings were likely to be passed on to consumers in lower prices, the net effect could be positive for consumers. **However, in the present South Africa case, there is significant scope to achieve efficiencies through the new proposed WOAN, further site sharing and network sharing more broadly without a reduction in the number of national wholesalers.**
 7. This means that a **consolidation from four national wholesalers (with an entrenched duopoly) to three would represent a large increase in concentration in an already highly concentrated market. Other things being equal, this would be likely to give firms an incentive to unilaterally raise prices or to be less competitive in other ways. There is also some risk that coordination between suppliers would become easier, especially if a disruptive competitor were eliminated.**
 8. Finally, there is significant scope to achieve cost efficiencies without a reduction in the number of national wholesalers. Whilst alternative outcomes are possible, the Authority would be concerned that a future consolidation from four to three players – and particularly one which eliminated a potential strong or disruptive competitive force could lead to a reduction in competitive intensity to the detriment of consumers.
- 68 As such, a reduction in competition in a market can allow firms (in this case the remaining national wholesalers) to profitably set higher prices, to invest less in new services, and to be less innovative, than would be the case in a more competitive market. This would be likely be an advantage of those remaining national wholesalers. However, the result of such a change would be worse outcomes for consumers, such as in higher prices, reduced choice and delayed access to improved or new services.
- 69 The market for mobile broadband services in South Africa is large, with service revenues of approximately R114 billion in 2019. The great majority of adults (and

many children) use these services, with 101.3m active mobile connections, and approximately 54m active mobile data connections. This suggests that even relatively small reductions in the intensity of competition could have a substantial economic impact. For example, if the reduction in competitive intensity increased prices by 1% and there was no volume response, that would be equivalent to a R1.14 billion loss of surplus over one year. If it were sustained over five years the loss of consumer surplus would have a net present value of R4.32 billion.⁶¹

- 70 A successful WOAN would also clearly mitigate against the risks mentioned in paragraphs 67, 68 and 69, above.
- 71 In this next sub-section, the Authority considers why such a reduction in the number of credible national wholesalers might come about following the auction and how likely that is. It is then in that context that the Authority consider whether it should put in place appropriate and proportionate measures to reduce the risk that such an outcome does arise, and if so, what those measures might be.

Overview of the approach to analysing the Competition concerns

- 72 The approach the Authority follows for considering the potential competition concerns identified are set out below.
- 73 In light of **the Authority's aim to enhance competition in future mobile markets**, the Authority considered how best to achieve this aim in order to fulfil the objectives set out in the ECA.
- 74 The Authority's analysis consists of four steps:
1. *Step 1:* consideration of the auction outcomes, i.e. post auction distributions of spectrum holdings in which a particular national wholesaler does not acquire additional spectrum in the auction, **absent specific measures to enhance competition.**
 2. *Step 2:* The Authority considered how likely it is that those outcomes would arise as a result of bidders' behaviour in the auction in the absence of any measures in the auction to enhance competition.

⁶¹ Assuming a discount rate of 10%.

3. *Step 3:* The Authority brings together the analysis in step 1 and step 2 to set out its views on the competition concerns that it should prioritise. The Authority does this by considering the magnitude of the detriment to consumers of an auction outcome, the likelihood of market conditions arising for the detriment to occur, and the likelihood that the national wholesaler in question would fail to acquire the required spectrum in the auction to avoid the outcome.
 4. *Step 4:* The Authority considered measures it should take to address concerns and set out the conclusions on what would be an appropriate and proportionate approach.
- 75 In Steps 2 and 4, we explicitly consider the implications of the measures for other national wholesalers, and whether they are still likely to obtain any spectrum they may need to be credible given the measures the Authority had taken.

Step 1: What auction outcomes might raise competition concerns?

- 76 The first step is to consider what outcomes from the auction could be detrimental to competition.
- 77 Given main competition concern that competition in mobile services is likely to be lower with fewer than **four** credible national wholesalers (excluding the WOAN), **the Authority focuses on what distributions of the IMT spectrum could result in fewer than four credible national wholesalers**. This involves identifying a number of dimensions to the capability of national wholesalers that may be affected by the spectrum they hold and how they relate to one another, including the trade-offs between them. The Authority then conclude on what may be necessary for a national wholesaler to be credible and what may contribute to a national wholesaler having sufficient capability to be credible. In forming this judgement (using Table 1), the Authority considers the extent to which national wholesalers need to hold particular types and quantities of spectrum in order to deliver different quality dimensions or whether there are alternative approaches or mitigation techniques available to national wholesaler to deliver those quality dimensions.
- 78 Using that assessment of the importance of the different capabilities, the Authority assessed in the round whether each of the existing national wholesaler and a new

entrant (WOAN) are likely to be **credible in the circumstances where it did not acquire any additional spectrum in the auction.**

- 79 Where the Authority concludes that there is concern that each might not be credible, the Authority goes on to consider what additional spectrum the national wholesaler might require to be credible. This analysis also enables the Authority to identify the sources of risk for its second type of competition concern – *that competition is weaker because one or more credible national wholesalers may be at a disadvantage in competing for some services and customers.*
- 80 It was noted earlier that there are high barriers to entry (and enhancing competition) in national wholesale mobile broadband services in addition to control of appropriate spectrum rights (which are scarce), namely (i) having a RAN and (ii) having access to sites across the country.
- 81 All four national wholesalers' existing spectrum holdings are *prima facie* likely for them to be sufficient. Indeed, Telkom Mobile has just under **double** (at 142MHz) the total spectrum holdings held by Cell C (at 76MHz) (see Table 2). All four national wholesalers have ownership of their individual RAN networks, though admittedly some are more expansive than others. This means the concerns are around (i) spectrum holdings (and types of spectrum held) (ii) as well as access and/or ownership of physical sites.
- 82 On spectrum holdings, it is more than noteworthy though to observe that **Telkom Mobile possesses no sub-1GHz spectrum** whilst the other three national wholesalers all have 22MHz each of 900MHz spectrum. As spelt out in Table 3, the '*Quality of Coverage*' and '*Minimum coverage and minimum average data rates*' dimensions are key to credibility - and hence to enhancing competition - **it is then ideal for all National Wholesale Operators to have access to Sub-1GHz spectrum bands.**
- 83 Similarly, on spectrum holdings, it is noteworthy to observe that Cell C neither possesses any 2300MHz/2600MHz/3500MHz spectrum. As seen in Table 2, Telkom Mobile has 60MHz of 2300MHz and 28MHz of 3500MHz.
- 84 As explained in Table 3, the '*Quality of Coverage*' and '*Minimum coverage and minimum average data rates*' dimensions are essential to credibility - and hence to

enhancing/maintaining competition - **it is then ideal for all National Wholesale Operators to have access to capacity spectrum bands.**

- 85 As concerns physical sites, considering the market shares at the local and metropolitan municipality level, Vodacom, MTN and Telkom are dominant in a number of municipalities (see Figure 3). Vodacom is dominant in 104 municipalities by itself, MTN is dominant in 18 by itself, and MTN and Vodacom are both dominant in 2 municipalities. Telkom is dominant in 11 municipalities, and in 99 municipalities no operator has a dominant share. However, given the structural separation of Telkom's wholesale and retail businesses, Telkom Mobile argues that it receives no benefit from this and is treated like any other potential access (to sites) customer.
- 86 In summary, there is arguably some key future competition concerns about Tier 2 National Wholesale Operators particularly concerning the 'Capacity and average data rates', 'Quality of Coverage' and 'Minimum coverage/minimum average data rates' essential dimensions to credibility.

CONCLUSIONS FROM STEP 1

- 87 As noted earlier, there is significant uncertainty regarding which auction/award outcomes (in which particular national wholesalers do not acquire additional spectrum) could be detrimental to competition. Nevertheless, it is necessary to make some judgements on this in order to assess the types of measures that could be adopted to enhance competition.
- 88 The Authority conclude on the following:
1. Tier 1 player's existing spectrum holdings, site dominance and dominance in retail markets are likely to be sufficient for it to be a credible national wholesaler into future even if **it wins no additional spectrum** (particularly sub-1GHz low frequency spectrum) in the auction/award. Whilst the Authority considers this outcome of Tier 1 players not winning further capacity at the auction unlikely, it is possible that Tier 1 National Wholesale Operators winning a large percentage of further sub 1 GHz spectrum at the auction would likely limit the future credibility of the Tier 2 players and a forthcoming WOAN, particularly if the latter wins no sub-1GHz spectrum. **It is then appropriate to impose the sub-1GHz spectrum cap of no more than 2 x 21MHz.**

2. This Assessment also proposes an **Overall Spectrum Cap of 184MHz**, binding on all national wholesalers and sub-national operators. This is based on ensuring that no operator obtains more than approximately 18% of the overall spectrum available (1,015MHz), which allows equal allocations of spectrum for at least 5 national wholesale operators and makes allowance for at least one additional sub-national operator. At the same time the overall spectrum cap allows all tier 2 operators to add at least 40MHz of spectrum to their current holdings (including sub-1GHz spectrum), taking into account inclusion for IMT3500 band on this licensing process.
3. The Authority is to ensure that the spectrum licence transfers (whether via mergers, acquisitions, etc.) would be bound by the spectrum floors and caps in order to continue to preserve and/or promote competition.
4. **One of the third or fourth national wholesalers is unlikely to be credible in the future without sub-1GHz additional spectrum and access to more sites.** This Competition Assessment has also benefitted from detailed avoided cost spectrum modelling carried out (using our best set of assumptions and current spectrum holdings in South Africa) suggesting that 2 x 10MHz of spectrum would be the optimum for this wholesaler's credibility.
5. The Authority therefore considered that this particular national wholesaler is likely to be credible with either Portfolios 1 and 2 from the table below, in combination with their extensive greater than 1GHz mid-band spectrum portfolio:

	700 MHz	800 MHz	2.6 GHz
Portfolio 1	2 x 10 MHz	-	-
Portfolio 2	-	2 x 10 MHz	-
Portfolio 3	2 x 10 MHz		1 x 10 MHz
Portfolio 4	-	2 x 10 MHz	1 x 10 MHz
Portfolio 5	2 x 5 MHz	-	1 x 20 MHz
Portfolio 6	-	2 x 5 MHz	1 x 20 MHz

6. Another of the Tier 2 national wholesalers is unlikely to be credible without additional sub-1GHz spectrum, additional mid-band spectrum and access to more sites. It is then ideal for all National Wholesale Operators to have access to sub-1GHz spectrum bands because 'Capacity and average data rates' and 'Minimum coverage/minimum average data rates' (see Table 3) are important dimensions for credibility.
7. It is unlikely that the dominant Tier-1 operators would not be able to secure essential mid-band spectrum at the auction. There is also the question of how much more sub-1GHz spectrum a Tier-1 operator needs to be able to continue to be competitive in South Africa into the future. Unlike another national wholesaler's lack of sub-1GHz, the Authority is more equivocal on whether an additional 2x5MHz or 2x10MHz (in addition to their 900MHz spectrum holdings) would be sufficient for credibility. The Authority's spectrum valuation modelling in terms of roll out costs savings – is towards 2x5MHz not least because Tier-1 operators can re-farm some of their current 900MHz spectrum holdings.
8. The Authority considers that Tier 2 national wholesalers are likely to be credible with any one of **Portfolios 5 and 6**, from the table below. This is because the avoided costs modelling analyses clearly point to a minimum optimum costs savings of 1x20MHz (or 2x10MHz FDD) block of 2.6GHz for a player like it to be credible.

	700 MHz	800 MHz	2.6 GHz
Portfolio 1	2 x 10 MHz	-	-
Portfolio 2	-	2 x 10 MHz	-
Portfolio 3	2 x 10 MHz		1 x 10 MHz
Portfolio 4	-	2 x 10 MHz	1 x 10 MHz
Portfolio 5	2 x 5 MHz	-	1 x 20 MHz
Portfolio 6	-	2 x 5 MHz	1 x 20 MHz

9. This Assessment also considered closely the sub-national players. However, this is focused on enhancing competition at the national wholesale level which would more likely deliver higher consumer benefits to South Africans. It is

acknowledged that market entry by sub-national RAN operators is a better outcome than no such market entry. However, the benefits of such entry aided by further acquiring spectrum are likely to be much less than the opportunity costs of such acquired spectrum, particularly for low sub-1GHz spectrum.

10. Furthermore, after the sub-1GHz spectrum portfolios to attract the 3rd and 4th national wholesalers and spectrum reservation the WOAN, the sub-national operators can also compete in winning invaluable sub-1GHz spectrum.
11. The Authority concluded that a successful **new WOAN entrant** would furnish a **fifth national wholesaler**.
12. A new WOAN entrant obviously needs to obtain sufficient coverage and capacity spectrum for it to be credible.
13. The Authority believes that the WOAN would need to obtain more spectrum in its next 5-year strategic cycle starting from 2020/2021 to 2024/2025 for it to maintain its credibility in the long term.
14. The Authority, therefore, reserves one of the following portfolios for the new entrant WOAN which would furnish it with as much spectrum (80MHz) above that of Tier-1 Operators today individually. More importantly, the vital sub-1GHz low frequency spectrum is also reserved for it.

	700 MHz	800 MHz	2.6 GHz	3.5 GHz
Portfolio 1	2 x 10 MHz	-	1 x 30 MHz	1 x 30 MHz

15. The portfolios above result in a total spectrum "reserved" for the WOAN of 80MHz. This is similar to Option 1 proposed in the IM. 80MHz is an equivalent total to the other proposals (i.e. Options 2 to 5) in the same IM. The Authority is also guided by its objective towards ensuring "the efficient use of radio frequency spectrum".
16. As such from valuations analyses and considering policy directions, and the analysis of the written representations, then the considered bands for licensing are to be sliced for auctioning as per the following LOTs sizes:

- 700MHz: 2 x 5MHz
- 800MHz: 2 x 5MHz

- 2600MHz: 1 x 10MHz (ALL TDD)
 - 3500MHz: 1 x 10MHz (ALL TDD)
17. For completeness, the optimum transparent way to award these IMT700MHz, IMT800MHz, IMT2600MHz and IMT3500MHz spectrum bands would be through a **competitive auction process**.
 18. A Simultaneous Multiple Round Auction (SMRA), with an opt-in round to attract other spectrum bidders, followed by a generic lots clock round, and assignment stage round is to be implemented.
 19. A licence is valid for twenty (20) years from the date of issue.
 20. All licences would be technology neutral. All the spectrum licences would be liberalised for IMT services (and other services) to the extent possible within spectrum masks constraints.
 21. All auctioned licences would continue to be subject to Annual License Fees (ALFs) as per the Radio Frequency Spectrum Licence Fees Regulations, 2010. This has been taken into consideration in setting (lower) reserve prices, and bidders may consider "pricing in" these ALFs in their valuations.
 22. The migration to Digital Terrestrial Television and the freeing up of IMT700 and IMT800 in South Africa is in progress. The Authority has taken this into consideration in two ways. The Authority has - in attracting applicants to these bands - set discounted reserve prices for IMT700 and IMT800 spectrum and secondly, it has increased the licence term from 15 years (which the Authority consulted on IM) to a proposed 20 years.

Step 2: How likely is it that auction outcomes that could give rise to competition concerns will occur- in particular, with fewer than four national wholesalers?

89 Under the previous step the Authority identified that there are some potential auction outcomes in which different national wholesalers do not acquire additional spectrum that might give rise to competition concerns. In this step the Authority considers how likely those outcomes are to come about, if there were no measures to enhance competition in the auction. By this it is meant as to whether a national

wholesaler that needs additional spectrum of a particular type and quantity in order to be credible or to mitigate a specific competitive disadvantage in relation to a particular service or customer segment will be able to acquire such spectrum in the auction.

- 90 The main concerns in this assessment relate to outcomes in which the third and fourth national wholesalers and the WOAN do not acquire the spectrum they need to continue to be or to become credible competitors absent measures in the auction. Given the identified risks for the Tier 2 national wholesalers, the Authority have also considered outcomes in which these national wholesalers do not acquire the spectrum they might need to address the risks to their credibility. **This can possibly happen because of the almost certain higher intrinsic and strategic investment values of the Tier 1 players.** In each case there is also a further competition concern about the national wholesalers' ability to compete across as wide a range of services and customers as would be desirable. The consideration of each category of national wholesaler is set out below.

Likely determinants of auction outcomes: intrinsic and strategic investment values

- 91 The allocation of spectrum in the auction is determined by the relative bids that participants make. This in turn is likely to be determined by their expected difference in profits from supplying wholesale and retail services with and without the spectrum.
- 92 The Authority distinguishes between two sources of value (i.e. profits) in bidding for spectrum:
1. **Intrinsic value.** The present value of additional profits a bidder expects to earn when holding the spectrum compared to not holding it, in the absence of any strategic considerations to obtain spectrum to reduce competition in mobile services from the existing level.
 2. **Strategic investment value.** The present value of additional expected profits earned from bids aimed at affecting the future structure of competition in mobile services *by depriving one or more competitors of spectrum.*

Table 4: Number of subscribers per operator

Operator	Connections
Vodacom	43m
MTN	30m
Cell C	15.9m
Telkom Mobile	11.5m
Rain	100k
Liquid	Small

- 93 In the second source of value the Authority is reflecting the fact that spectrum is a strategic asset for national wholesalers and access to spectrum is likely to have a major impact on a national wholesaler's competitive strength in the market.
- 94 Moreover, spectrum is a scarce resource and the forthcoming auction of spectrum is the best opportunity to access additional spectrum resources. This suggests that the outcome of the auction is likely to shape the future competitiveness of the mobile sector for at least the next decade. Recognising this potential lasting impact, some national wholesalers might have an incentive to buy more spectrum than would otherwise be the case with the aim of weakening rivals and thereby reducing the competitive constraint that they will face.
- 95 As Table 4 depicts, MTN (the second largest in terms of connections) almost has double the number of connections of third-placed Cell C, and almost 3 times Telkom Mobile's connections. As for Vodacom, it has just under three times the number of Cell C connections and almost four times Telkom Mobile's. The clear message is that the intrinsic and strategic investment values for the Tier 1 players are likely to be significant compared to Tier 2 players.
- 96 In considering strategic investment in this way, we are not supposing that bidders, individually or collectively, will act in a prohibited manner. The Authority consider whether strategic investment by one or more bidders (particularly the Tier 1 players), in pursuit of rational commercial goals, might result in an outcome that could make the market less competitive, such that it posed a risk to the ECA objective to promote competition through the auction.

Conclusions from Step 2

97 The risks related to the third and fourth national wholesalers not acquiring the spectrum they need to continue to be or to become credible competitors absent measures in the auction – **are very high**. The Authority's pro-competition measures (sub-1GHz caps, overall spectrum caps, spectrum portfolios/floors, WOAN etc) are individually and collectively justified and proportionate.

Step 3: Summary of potential competition concerns if there were no measures in the auction to enhance national wholesale competition

98 The competition concerns include (all of them **medium to high risk**):

- Fewer than four credible national wholesalers in the mobile market in the short term.
- Perhaps even fewer than three national wholesalers in the medium term (with higher likelihood of the exit of both the third and fourth national wholesalers).
- Even if there remain four national wholesalers, one or more is at a disadvantage in competing for some services and customers.
- Weaker competition because one or more players do not have sub-1GHz spectrum, e.g. one national wholesaler's lack of sub-1GHz spectrum may hamper it.
- Another national wholesaler arguably not being credible because of lack of further sub-1GHz spectrum.
- Weaker competition because one or more players do not have mid-band spectrum, e.g. one national wholesaler may not be credible because of insufficient mid-band spectrum (at 2.6GHz or 3.5GHz) to achieve high data rates with the employed technologies.
- Weaker competition because one or more competitors has a very large share of spectrum.

- No new entry is permitted in such a market with “ineffective competition”.
- There is no competitive rollout of fast speed mobile broadband services in under-serviced areas of South Africa.
- Other sub-national players are foreclosed the opportunity to win valuable low frequency sub-1GHz spectrum, even if they have strong business cases through attracting them of all of the spectrum and/or no caps on sub-1GHz spectrum.
- Further opportunities for downstream retail competition (to drive down prices, improve quality, improve choice, etc) are foregone.

99 It is for these reasons (i.e. concerns) and more covered earlier that the Authority have proposed measures in the auction to enhance national wholesale competition.

Step 4: Measures to enhance national wholesale competition

100 The final step is to consider in the round what measures are appropriate and proportionate to adopt to enhance national wholesale competition.

101 The measures are set out in this Competition Assessment and in the ITA.

1. **Reserve Price and Considerations of roll out obligations:**
2. Licensing Aim: determination of fair economic value of radio frequency spectrum is in the consumers’ best interests. The proposed methodology for the reserve price is one of setting material reserve prices close to estimated value of spectrum but with a discount. The reserve price approach also takes particular regard to the weaker Tier 2 national wholesalers to ensure they are more likely to remain credible post the auction, in addition to any spectrum reservations.
3. In light of Authority’s primary aim to ‘enhance competition and to increase broadband coverage, and in so doing bridge the digital divide and the disparities between urban and rural access to broadband networks’ – fair economic valuation of the spectrum must take into consideration the proportionality in realising this primary aim by any of the wholesale national competitors.

4. The manner in which the Authority has carried out the fair market valuations of the IMT700, IMT800, IMT2600 and IMT3500 bands had to mitigate against the risk to attract the third and fourth national wholesalers to certain spectrum bands, while the opposite would have been in consumers/citizens' interests. It might be against consumers/citizens' interests to attract a third and fourth national wholesalers if they had a much lower intrinsic value from other parties (e.g. sub-national operators) that would otherwise have obtained the spectrum, and if the competition benefits from having at least four national wholesalers were not large. The Authority has considered this risk when carrying out the fair economic valuations. The reserve prices for the spectrum helps mitigate this risk that the Authority makes certain spectrum bands attractive to third and fourth national wholesalers when it is not in consumers' interest.
5. On the other hand, the risk of high valuations which mitigate against rollout obligations – particularly for the weaker players – was guarded against in the spectrum valuations.
6. The approach of the Authority to the valuations of the spectrum bands is conservative but fair.

Competition Assessment: future retail competition

Aim: Innovation with Community Networks – Spectrum Sharing

102As explained earlier, the Authority is not ignoring retail-level competition in this assessment and the Competition Commission's DSMI inquiry highlighted problems in retail-level competition. The Authority's aim in the context of this competition assessment is the enhancement of competition in markets for the provision of mobile services, in respect of both wholesale and retail markets. In addition to those measures proposed at the wholesale level, the Authority considered whether competition would be enhanced at the retail level. Entry or expansion by sub-national RAN operators could allow competition over more of the value chain and facilitate innovative business models, including through the deployment of 'inside-out' networks.

103 Any underutilised spectrum bands during the deployment stage of the National Wholesale players in designated "underserviced areas" are to be availed for

spectrum sharing with other licensees using, amongst others, dynamic spectrum access methods.

104 The Authority is of the view that such a measure is appropriate and proportionate:

1. **Market entry by sub-national RAN operators is a better outcome than no such market entry** – i.e. the benefits of such entry are likely to exceed the opportunity costs;

2. and if so, there is a significant risk that such entry would not occur in the absence of such a measure.

105 This could allow for more local competition over the value chain and facilitate innovative business models, through the deployment of 'inside-out' networks.

Benefits, Costs and Risks of entry by sub-national RAN operators

106 Market entry by sub-national RAN operators could deliver substantial benefits to consumers. By adding mobile services to a fixed high-speed broadband network, sub-national RAN operators could potentially offer improved indoor coverage, Wi-Fi, high data rates and other broadband services. **There is also the possibility that these operators could introduce paradigm-shifting business models, for example from being able to integrate fixed and mobile delivery of TV, broadband and telephony services on multiple devices.** In either case sub-national RAN operators could provide a disruptive competitive force to the benefit of consumers.

107 If the unused spectrum in underserved areas is not accessible by such operators but by ONLY wholesale national wholesalers, this would foreclose the innovation value by allowing increased capacity and higher average data rates or in the extreme the deployment of innovative networks such as the use of dynamic spectrum access for those without other spectrum that is suitable for early deployment of IMT Advance. Denying this value is the opportunity cost of the use of this unused spectrum by sub-national RAN operators.

108 The enablement of simple unlicensed registrations by Community and Micro operators using authorised RLANs such as 5GHz radio frequency spectrum bands will improve innovation. Such a move complementing unlicensed access to spectrum

to that of licensed spectrum, as well as enabling unused spectrum for secondary use (dynamic spectrum access), would lead to networks in South Africa operating at a small fractional cost of IMT services/networks.

Benefits, Costs and Risks of entry by “Other Retailers”

109 The Authority has considered the risks of allowing other operators access to unused spectrum in rural municipalities and “underserviced areas” which include the following:

1. co-ordination issues and failures amongst such networks
2. spectrum management and interference challenges on the use of different spectrum: unused 2.6GHz frequency band, defining “underserviced areas”, TVWS regulations, economies of scale and scope of LTE, Wi-Fi and dynamic spectrum access systems, etc.

110 The Authority notes the risk that these operators may fail to agree on coordination arrangements. However, the Authority has balanced this with some successful community networks in South Africa and the existing regulatory framework such as an automatic dispute resolution mechanism as provided in regulation 20 of the Radio Frequency Spectrum Regulations, 2015.

Conclusion

111 This competition assessment took into consideration the current state of the competition, as it aims to improve the competition landscape post the auction in the ICT sector. It takes a view that the market can sustain five credible wholesale national operators including the WOAN, without excluding any other sub-national operators to become additional credible wholesale national operators, in an endeavour to deal with the highly concentrated market.

SPECTRUM VALUATION: DERIVATION OF RESERVE PRICES

BACKGROUND

1. The reserve price is the price below which the Authority will not licence the spectrum bands being considered on this process for auction. All good spectrum auction designs are also a balance between price discovery and the risk of collusion in the auction amongst the bidders and setting the reserve prices provides a realistic starting point for price discovery.
2. An important aspect of establishing reasonable reserve prices is considering lessons from the failure of auctions or spectrum sales historically. This includes instances in which reserve prices have been set too high or when other requirements result in the failure of the auction process.

Introduction & Reserve prices

3. This section outlines the **overall framework** the Authority has used in determining the reserve prices for the forthcoming auction. A summary of the reserve prices is set out in Table 1 below:

Table 1: Reserve prices

SPECTRUM BANDS	RESERVE PRICE FOR EACH LOT ON A PARTICULAR SPECTRUM BAND
700MHz 2x5MHz	R526 615 392.49
800MHz 2x5MHz	R752 307 703.55
800MHz 2x10MHz	R1 155 174 976.66
2600MHz 1x10MHz	R97 843 320.52
3500MHz 1x10MHz	R75 606 202.22
3500MHz	R9 818 987.30

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1x2MHz	
3500MHz	R19 637 974.60
1x4MHz	

4. This section has the following structure:

4.1 First, the rationale for setting the reserve prices in the auction is set out. This explains the different risks that were considered relevant to setting the reserve prices for this auction.

4.2 Second, the Authority presents the studies conducted for the derivation of the reserve prices. In particular, the Authority reports on two approaches that it has carried out:

4.2.1 Avoided Cost Modelling: Analysis of the value of the bands that are to be auctioned by quantifying the costs that operators would avoid if they had additional spectrum; and

4.2.2 International Benchmarking: The Authority considered the valuations of spectrum in other countries.

4.2.3 The above studies are the science of reserve price modelling, as it is replicable.

4.2.4 Third, the Authority set out the reserve prices for spectrum categories (summarised in the table above) and discuss how these proposals were derived by striking a balance between the different risks and drawing from other recommendations and other evidence.

4.2.5 In contrast to the latter, this is the art of setting reserve prices.

Policy rationale for setting reserve prices and risks

5. The reserve price is the price below which the Authority will not licence the spectrum bands being considered in this process for auction. All good spectrum

auction designs are also a balance between price discovery and the risk of collusion in the auction amongst the bidders and setting the reserve prices provides a realistic starting point for price discovery.

6. **The risks of low reserve prices to deter frivolous bidding:** a typical basic approach to setting reserve prices is one of setting prices at a low but not trivial level in order to discourage frivolous bidding. The benefit is that a low reserve price provides a wide margin for price discovery during the principal stage of the auction. However, low reserve prices may incentivise bidders to tacitly collude, closing the auction quickly and allowing operators to win much valuable spectrum very cheaply. Similarly, low reserve prices may incentivise bidders to engage in *strategic demand reduction*, i.e. bidders bid for lower number of lots of spectrum than they really need in the hope that they would win less spectrum, but at a lower price. This would likely result in an *allocative efficiency* failure, i.e. spectrum does not get into the hands of those that value it the most. Therefore, a low reserve price strategy carries much risk.
7. **The risks of high reserve prices:** On the other hand, while a high reserve price minimises allocative efficiency risks, it reduces the scope for price discovery during the various rounds of the auction. Furthermore, a high reserve price may discourage participation particularly from the weaker and/or smaller marginal players. It increases the risk of unsold spectrum. Or it may also preclude other possible users and uses of the spectrum through exclusion from the auction.
8. **Reserve price risks in South Africa to balance:** specifically, in the mobile broadband market in South Africa:
 - i. there is a risk that much bigger bidders with deep pockets and much higher strategic valuation of the spectrum than their intrinsic valuations would outbid the smaller/weaker bidders in the auction if there are no competition measures to pre-empt this risk.
 - ii. the risk of high reserve prices deterring the potential third and fourth national wholesalers (or opted-in bidders) from being unable to obtain reserved spectrum in the auction would be against consumers and citizens' interest.

- iii. another risk is that the opted-in bidders win spectrum when it would *not* have been in consumers' interest because the intrinsic value to such bidders is much lower than other parties in the auction.
 - iv. the risk of strategic demand reduction, discussed earlier, which arises if reserve prices are low.
 - v. there is also a risk of tacit collusion amongst bidders in order to lower prices leading to failed allocative efficiency in the auction.
 - vi. with so many bands, there is a risk of unsold spectrum because the reserve prices are set too high, leading to the marginal bidder(s) of the last spectrum lot (or more) in any band not winning spectrum.
 - vii. also, with so many bands being auctioned, the risks are high that the reserve prices set per band do not reflect the relative market value across these bands. This would reduce efficient allocation due to the likely distortion of the optimum combinations of spectrum that bidders would have selected across the different bands.
9. See the Competition Assessment report for more details on some of these concerns.

Summary "raw" reserve price numbers obtained from two best practice valuation approaches

10. The following analysis/studies were conducted of the value of the bands that the Authority seeks to auction:
- i. **International benchmarking:** considering the valuations of spectrum in other countries, and
 - ii. **Avoided costs modelling:** quantifying the costs that operators would avoid if they had additional spectrum ('avoided costs').

International benchmarking

11. The international benchmarking was done by analysing reserve prices and auction prices paid for spectrum internationally in spectrum auctions. By normalising this data to conditions in South Africa, it is possible to establish a range of potential values for each band under consideration.
12. The main results from the international benchmarking are summarised in Table 2. The ranges formed the basis of the first set of "raw numbers" used.

Table 2: International benchmark valuation of relevant spectrum

	700MHz 2x5MHz	800MHz 2x5MHz	2600MHz 1x10MHz	3500MHz 1x10MHz
Reserve Price Range	R5.9M–R2.1B Avg: R487M (47 data points)	R5.9M–R2.1B Avg: R487M (47 points)	R0–R2.98B Avg: R198M (63 points)	R0–R2.98B Avg: R198M (63 points)
Auction Price Range	R12.5M–R3.6B Avg: R853M (41 data points)	R12.5M–R3.6B Avg: R853M (41 points)	R2M–R4.5B Avg: R610M (68 points)	R2M–R4.5B Avg: R610M (68 points)

Avoided costs modelling

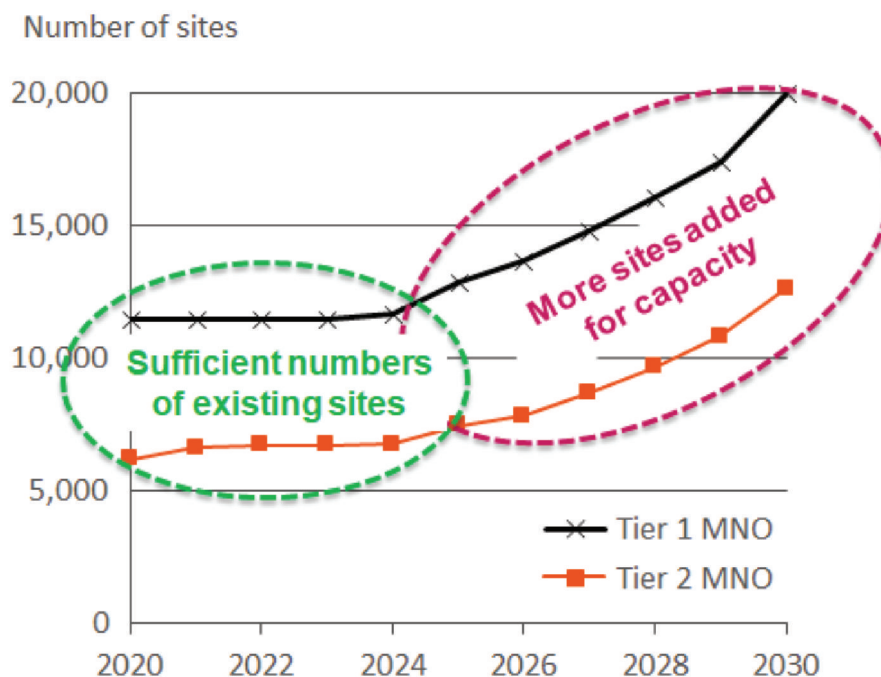
13. The avoided costs modelling involves estimating the network deployment costs for operators in South Africa over a period of time. This is helpful to understand how access to additional spectrum may reduce deployment costs. Such cost reductions are an indication of what an operator might be willing to pay for the spectrum. This is an appropriate best practice economic valuation methodology/approach for the estimation of market value for the following reasons⁶²:
- It is based on sound economic and engineering principles (adapted to market circumstances in South Africa);
 - It provides a robust estimates of spectrum value as it is based on the way Mobile Network Operators in South Africa plan network deployment and value additional spectrum to account for traffic growth; and
 - It is practical to implement.
14. The Authority modelled two generic but representative hypothetical MNOs, similar to existing operators. Firstly, a hypothetical stronger operator with a larger number of sites as the Tier 1 MNO and a hypothetical weaker operator comparable to the Tier 2 MNO. The Authority estimates that the avoided cost analysis over a 11-year period i.e. 2020 to 2030. This is carried out by estimating the Net Present Value (NPV) of network deployment costs both with and without additional spectrum. The difference in NPVs provides an estimate of the spectrum value. The main results from the avoided costs analyses are summarised in Table 3. The ranges form the basis of the second set of “raw numbers” used to develop our recommendations.

⁶² See Plum Consulting: <https://plumconsulting.co.uk/methodologies-valuing-spectrum-review-experts-report/>

Table 3: Avoided costs valuation of relevant spectrum in South Africa (Medium Traffic Growth Scenario)

	700MHz 2x5MHz (2x10MHz)	800MHz 2x5MHz (2x10MHz)	2600MHz 1x10MHz (1x20MHz)	3500MHz 1x10MHz (1x20MHz)
Tier 2 Small Bidder	R521M (R1468M)	R521M (R1468M)	R308M (R719M)	R308M (R719M)
Tier 1 large bidder	R537M (R1270M)	R537M (R1270M)	R288M (R815M)	R288M (R815M)

15. The results showed that 2x10 MHz provides the highest benefits on IMT700 and IMT800 spectrum bands. The cost savings diminish with further spectrum (i.e. 2x15/1x30MHz and 2x20/1x40MHz).
16. The avoided costs from additional spectrum are dominated by the increase in data demand predicted for South Africa, rather than meeting the long-term coverage targets. Therefore, for these bands, the amount of spectrum on offer is **more important** than the difference in cell range.
17. In the early years of network deployment (see Figure 1), costs are usually driven by the site count required to deliver the coverage targets. MNOs can make use of the existing population of sites to increase the capacity of the network by deploying additional spectrum on those sites. Thus, the increasing traffic demand can initially be met by deploying additional spectrum on those existing sites (at the cost of additional hardware). In later years the deployed capacity starts to become insufficient to meet demand. Even with additional spectrum, costs are driven by the network densification required to provide sufficient capacity.

Figure 1: Site requirements for Tier 1 and Tier 2 MNOs**Reserve price methodology – “estimated market value but with a discount”**

18. Three approaches or methodologies were considered to derive the final reserve prices considering the international benchmarking and avoided costs valuation “raw numbers”:
 - i. **Low but not trivial reserve prices** to deter frivolous bidders. The Authority discounted this approach for reasons given earlier.
 - ii. Material (and close to likely market) reserve prices drawing from international benchmarking and/or avoided costs valuation – this could be termed the “**market value estimated in a conservative way**” approach.
 - iii. Setting reserve price at a level that is based on an estimate of likely value of the spectrum (but with a mark-down) – this is the “**estimated market value but with a discount**” approach.
19. The Authority has drawn from international best practice – drawing from (i) Ofcom’s 2013 4G (800MHz/2.6GHz) auction, (ii) their 2015 auction in the

2.3GHz/3.4GHz bands and the proposed (2020/21) 5G auctions. In those auctions, Ofcom mostly adopted the last of these three approaches, i.e. setting reserve prices based on an estimate of the likely value of spectrum with a mark-down, i.e. the *estimated market value with a discount approach*.

20. This view balances the various risks identified in Paragraph 6. For example, the risk of strategic demand reduction and/or tacit collusion could be mitigated by a reserve price being material and closer to likely value of the spectrum, which a "market value estimated in a conservative way" approach would do. On the other hand, the risk of opted-in bidders failing to acquire the attractive spectrum, or the risk of unsold spectrum could be mitigated by discounting "estimated market value prices", and by setting market prices in the first place cognisant of weaker/smaller opted-in bidders. The latter approach strikes an appropriate balance between the risk of tacit collusion and the risk of excluding smaller bidders.
21. The residual (but very important) issue is what discounts are commensurate with the risks in Paragraph 6 (and more). This is mostly **an art**, not a science.
22. There are other risks and/or factors that the Authority considered relevant that also arguably need to be "discounted" for.
 - i. DTT transition risks: Encumbered spectrum in IMT700 and IMT800 bands;
 - ii. Annual licence fees: this risk can be dealt with more "scientifically" from bidders factoring and "pricing in" into their valuations;
 - iii. Device ecosystem in specific bands: can also be "internalised" by bidders, but it is a justifiably relevant factor;
 - iv. The value of aggregating bands; and
 - v. Attracting bidders to participate in the auction.
23. Hence, the methodology adopted to derive the final reserve prices for the bands is largely the *"estimated market value but with a discount"*. As noted above, the Authority believe it balances across the risks of Paragraphs 8 and 22.

24. The "estimated market values" to be discounted are more "scientifically" derived via (i) international benchmarking and (ii) avoided costs modelling as shown in Table 2 and Table 3.

Prohibited Practice and other disruption to the auction

25. The Authority had put in place the following measures to minimise the risk of collusion and to ensure that the auction runs effectively. These measures are over and above what is stipulated in RFSR, however, empowered by regulation 7 (2)(o) RFSR. Until the conclusion of the award process (i.e. once Licences have been issued) applicants must not:
- 25.1 Disclose any Confidential Information to other Applicants,
 - 25.2 Enter into agreements with other Applicants in relation to the award process, or
 - 25.3 Undertake any action that may adversely affect the award process.
 - 25.4 Disclosure of information of any nature, which, directly or indirectly, concerns a Bid submitted by an applicant or a Bid that an applicant considers submitting, if such information could affect the price that an applicant would offer. Confidential Information must include any non-published information about an applicant's strategy, including the Bid that an applicant is willing to submit, which may affect the applicant's price or submission of a Bid, and which may influence the applicant's fulfilment of its Bid, as well as information about financing the Bid sum.
26. Any cross-directorships or cross-shareholdings between Applicants is not permitted, and applicants are not permitted to agree on any price or on any allocation of markets or spectrum between each other.

Deriving proposed reserve prices using the methodology

27. The Authority considered three approaches or methodologies to derive the final proposed reserve price proposals considering the international benchmarking

and avoided costs valuation “raw numbers”. The “low but not trivial reserve prices” approach were avoided.

28. The proposal for reserve prices focus on the benchmark range for hypothetical Tier 2 smaller/weaker bidders in order to mitigate the risks explained in Paragraph 8 (i) and (ii). This clearly implies a discount to market value as would be estimated considering all bidders including those with much larger intrinsic valuations.
29. Therefore, the Authority began with estimated market spectrum values of the hypothetical weaker Tier 2 MNO. More specifically, this is because this would most likely determine the hypothetical auction price, as the Authority does not want to set reserve prices at a level that might lead to further industry consolidation, and hence less competition. The discount rationale, i.e. using the valuation for the small bidders rather than the larger bidders, particularly for IMT700 and IMT800, can be observed in Table 4. The justification for using the small bidder valuation is even more stark for 2x10MHz lots.

Table 4: Pre-discount reserve prices

	700MHz 2x5MHz (2x10MHz)	800MHz 2x5MHz (2x10MHz)	2600MHz 1x10MHz (1x20MHz)	3500MHz 1x10MHz (1x20MHz)
Tier 2 Small Bidder (from Table 3 Avoided Costs)	R521M (R1468M)	R521M (R1468M)	R308M (R719M)	R308M (R719M)
Reserve Price Range (from Table 2 International benchmarks)	Avg: R487M (47 data points)	Avg: R487M (47 points)	Avg: R198M (63 points)	Avg: R198M (63 points)
Recommended pre-discount reserve prices	R521M	R521M	R308M	R308M

30. Table 4 shows the pre-discount reserve price recommendations, choosing the higher of the “scientific” avoided costs of the Tier 2 Operator and lower of the international benchmarking analyses.
31. The pre-discount reserve prices from Table 4 are consistent with the “market value estimated in a conservative way” approach and safeguarding against the risks of low reserve prices to deter frivolous bidding. The Authority in consolidating the results of the two models from Table 4 decided to set higher pre-discounted reserve price values from the avoided cost model noting that the pre-discounted reserve price values will be discounted.
32. The Authority could have stopped at these pre-discount reserve price proposals. However, consistent with our “estimated market value but with a discount” methodology, the Authority further considered band-by-band discounts – and these require a degree of discretion and judgements given the range of other relevant considerations. This approach also allows for addressing the risks such as Paragraph 8 (vi) and (vii), as well as the risks identified in Paragraph 22.

IMT700MHz vs. IMT800MHz discounts

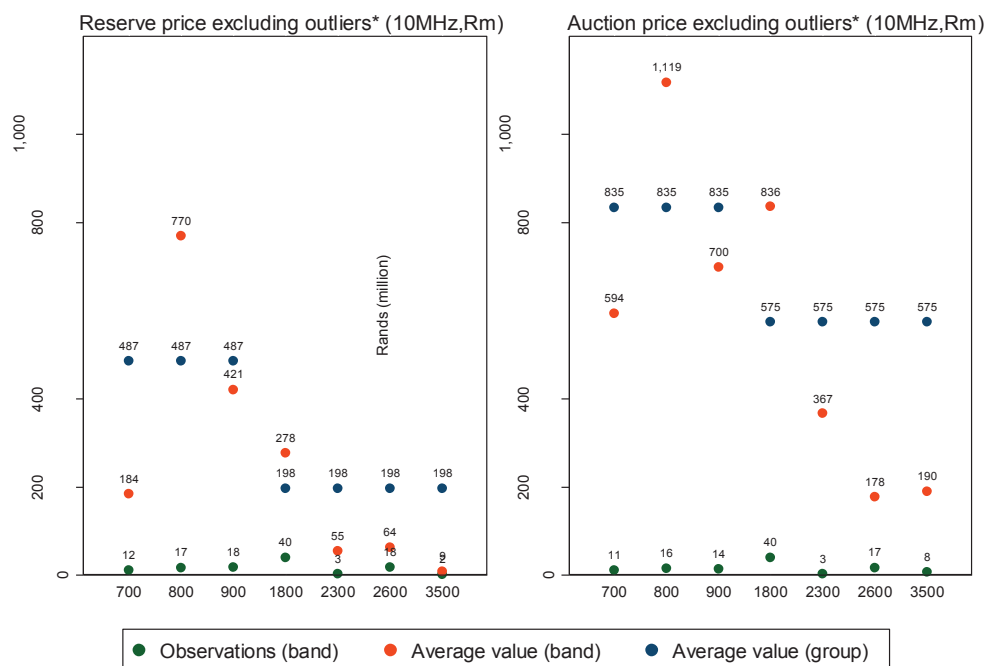
33. **IMT700 FDD vs. IMT800 FDD Bands discounts:** The Authority has studied spectrum awards in Europe that included 700MHz and 800MHz FDD spectrum to see if it needed any discounting between 700MHz and 800MHz starting from the pre-discount reserve price estimates.

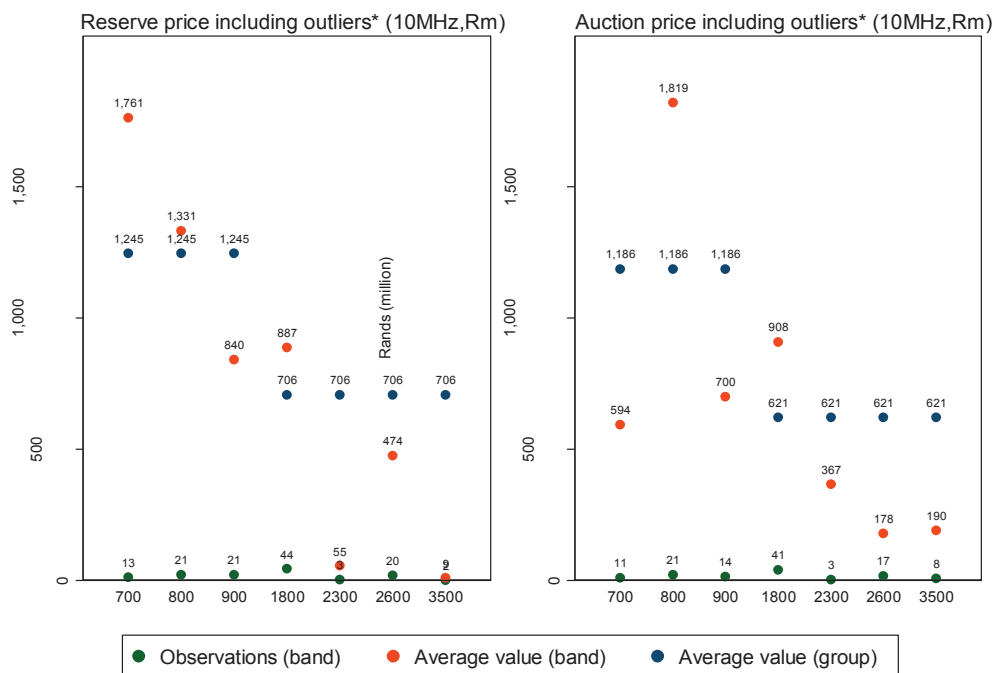
Table 5: A discount proposal between 800MHz and 700MHz reserve prices (based on Ofcom UK reserve prices/proposals)

UK	700MHz (2 x 5MHz)	800MHz (2 x 5MHz)	(Implied) Discount from 800MHz to 700MHz
Reserve price (2019 basis)	[£100M – £240M] Mid: £170M	£245M	30%

34. This is arguably needed for 700MHz relative to 800MHz given the far more advanced ecosystem of equipment and devices in 800MHz compared to the relatively newer 700MHz FDD IMT band in the ITU Region 1 in general and in Africa in particular.
35. The reviewed averages from the benchmarking studies between 700MHz and 800MHz were considered, see Figure 2. For example, the figure shows that the average reserve price for 800MHz across the sample is R770m compared to R184m for 700MHz. This estimates a ratio of 4:1 in favour of 800MHz over 700MHz. The Authority is of the view that this ratio made much sense for South Africa in 2020, not least given the substitutability of these bands as the 700MHz ecosystem evolves fast. The ratio is arguably reflective of the much later identification of 700MHz as an IMT band (only after 2015) compared to 800MHz.

Figure 2: Reserve prices for 10MHz (2x5MHz or 1x10MHz), adjusted for GDP per capita, PPP (Rm, PPP)





* Note: Outliers are Bangladesh, Croatia, Ghana, Hungary, India, Mozambique

36. Hence as Table 5 depicts, the Authority has studied closely Ofcom's 700MHz vs. 800MHz FDD reserve prices⁶³ in which Ofcom proposes a reserve price for 2x5MHz lot in the range of £100M-£240M per lot compared to £245M (in 2018 prices) of the £225M reserve price per lot of 800MHz in 2013. Ofcom has not yet chosen a specific reserve price for a 700MHz FDD lot, but at the higher end (at £240M), it is broadly equivalent to the reserve price of 2013 for an 800MHz FDD lot. At the lower end (£100M), it is approximately 40% of the higher end. We have applied an estimate of £170M, being in the mid-point of the £100-£240M range.
37. This would suggest a reserve price discount for 700MHz of approximately 30% with respect to an 800MHz lot. The Authority imposed **30% discount between 700MHz and 800MHz** reserve prices in favour of the former.

⁶³ https://www.ofcom.org.uk/data/assets/pdf_file/0028/172648/revised-proposal-auction-design.pdf (2019)

Ratios between the 700MHz and the 2600MHz & 3500MHz bands

38. "Discounting" with the "market value estimated in a conservative way" approach would typically be achieved by proposing relative reserve price ratios between bands.
39. **2600MHz and 3500MHz TDD Bands discounts:** for example, the Authority considered the R308M pre-discount reserve price to be very high for South Africa for 1x10MHz in these bands. The ratio between 700MHz/800MHz vs. these bands is 1.7:1 (approximately) as seen in Table 4. This needs to be contrasted with the UK 2013 4G auction reserve price of £225M for 2x5MHz of 800MHz vs. £15M for 1x10MHz (then 2x5MHz), i.e. a ratio of 15:1. Further evidence to justify R308M being too high can be observed during the benchmarking studies summarised in Figure 2. It shows that the average for 2600MHz and 3500MHz are R64M and R9M respectively – significantly lower than R308M.

Table 6: In-country ratios of reserve prices per 10MHz of 700MHz vs. other bands

Ratio descriptor	Estimated average reserve price ratio
700MHz/2600MHz	2.9 (one country data point, Switzerland)
700MHz/3500MHz	24.3
800MHz/2600MHz (UK-2013)	15

Source: see Annexure 4 – selecting from countries including Denmark, Finland, Germany, Italy, Switzerland and UK

40. Table 6 shows that the ratios of 700MHz (or 800MHz) reserve prices to 2600MHz and 3500MHz are typically much higher than the ratio implied in Table 4. This clearly suggests caution and that several highly regarded regulators proceed with their best judgments on such ratios in order to propose band by band reserve prices.

Proposed ratio between 700MHz and 3500MHz spectrum band

41. **3500MHz ratio:** In contrast to the 24:1⁶⁴ reserve price ratio between 700MHz and 3.5GHz (see Table 6), the in-country ratios of final auction prices between

⁶⁴ Averaging from 700MHz/3500MHz in-country ratios across Finland, UK, Switzerland and Denmark

700MHz and 3.4-3.8GHz bands are much lower (3:1 ratio average as seen in for three European countries, see Table 7), closer to the pre-discount ratio in Table 4. However (and clearly), the reserve prices are typically set nowhere close to such ratios (as 3:1) as Table 6 attests.

Table 7: In-country ratios of auction prices per 10Mhz of 700MHz and 3.4-3.8GHz (source: Ofcom⁶⁵)

Finland	5.3
Germany	1.6
Italy	2.0
Average	3.0

42. In addition, these European markets have very different dynamics from the South African market. In South Africa, there is already some 3500MHz in the market assigned to incumbents. In addition, there is much supply of 1 x 86 MHz, for the auction that may dampen competition.
43. The Authority therefore prescribes a **7:1** (approximately) **reserve price ratio** – which is an approximation from the various sources provided above (i.e. the average of 24.3 from Table 6 and 3.0 from Table 7). The true average is 13.65, but it was reduced to 7:1 (approximately).
44. There is significant uncertainty about the relative prices of 700MHz and the 3500MHz band in the auction. The Authority has therefore examined two types of evidence which serve as reference points: a real average of reserve price in-country ratios from selected European auctions (Table 6), and the average of ratios achieved for this 3500MHz band at actual auctions in three European countries (see Table 7). The ratio of 7:1 (approximately) for this band provides a reasonably-evidenced position to commence price discovery in an auction.

Proposed ratio between 700MHz and 2600MHz spectrum band

45. **2600MHz Discount:** Table 6 suggests an average ratio of 2.9 ⁶⁶.

⁶⁵ See: https://www.ofcom.org.uk/data/assets/pdf_file/0028/172648/revised-proposal-auction-design.pdf (2019)

⁶⁶ Albeit the in-country ratio from a single country - Switzerland

46. In South Africa, there is also already some 2600MHz in the market assigned to the incumbent as TDD (1x20MHz). There is therefore a significant 1 x 140MHz to be awarded in this auction with a set-aside of 1 x 30 MHz for the WOAN application process. The demand for this band would more competitive than for 3500MHz. The Authority therefore prescribes a **5:1 ratio** (approximately) for 10MHz of 700MHz: 1x10MHz of 2600MHz. This provides a reasonably evidence-based position to commence price discovery in an auction.
47. Using all these proposed discounts and ratios the Authority derive the following reserve prices for the bands:

Table 8: Post-discount reserve prices

	700MHz 2x5MHz	800MHz 2x5MHz	2600MHz 1x10MHz	3500MHz 1x10MHz
Recommended pre-discount reserve prices	R521M	R521M	R308M	R308M
Proposed Reserve Prices (after discount where applicable)	R364 700 000,00 (30% discount to 800MHz)	R521 000 000	R67 760 000,00 (1:5 ratio to 700MHz)	R52 360 000,00 (1:7 ratio to 700MHz)
Implied discount to pre-discount reserve price proposals	30%	0%	78%	83%
Final Reserve Prices after applying a Premium	R526 615 392.49	R752 307 703.55	R97 843 320.52	R75 606 202.22

Commentary on discounts applied to pre-discount reserve prices

48. The Authority acknowledges that, as Table 6 attests, some of the discounts to the pre-discount reserve prices are quite significant at 78% and 83%. These are not unusual discounts. For example, at the Ofcom (2013) 4G auction, Ofcom's consultants recommended a reserve price of £50.4M for 2x5MHz of 2600MHz. However, Ofcom chose to proceed with a reserve price of £15M per 2x5MHz lot, i.e. a 70% discount to the DotEcon and Aetha's recommendations⁶⁷.
49. The significant discounts reflect the significant uncertainty of the valuations of these bands in South Africa and the risks, whilst considering that the proposed reserve prices are not too low to commence the price discovery process at the auction. Returning to the 2600MHz and 3500MHz bands, the Authority prescribes before applying premium R67.76M and R52.36M respectively as shown in Table 8. As a sense check, these prescribed reserve prices before applying inflation are much closer to the *benchmarking* averages for 2600MHz and 3500MHz shown in Figure 2 at R64M and R9M respectively – significantly lower than the pre-discount numbers of R308M each.
50. The Authority's final reserve prices are indicated in the last row of Table 8 after applying a premium to the proposed reserve prices (after discount where applicable). The premium was applied to guard against the risks of setting low reserve prices to deter frivolous bidding but without setting too high reserve prices which may derail the auction and discourage marginal players with smaller budgets. The Authority is of the considered view that the set reserve prices provide an opportunity for a price discovery of the spectrum bands to be acquired through the auction.
51. The Coverage Lot on IMT800 (i.e. 2 x 10 MHz) is discounted by approximately 23% from the recommended pre-discounted reserve price of the IMT800 valuation of 2 x 5MHz and with the application of a premium. A discount is accounted for the coverage obligation attached to this Lot. The final reserve price for the 2 x 10 MHz Coverage LOT on the IMT800 is R1 155 174 976.66.

⁶⁷ https://www.ofcom.org.uk/data/assets/pdf_file/0031/46489/statement.pdf (see Table 8.3) of Section 8 on Reserve prices

52. Furthermore, the 1x2 MHz and 1x4 MHz on the IMT3500 band was deduced from the final reserve price of the IMT3500 on a per MHz basis and discounted respectively for both bands. The 1x2 MHz and 1x4 MHz final reserve prices are R9 818 987.30 and R19 637 974.60, respectively.
53. The Authority also acknowledges that these discounts and/or ratios are judgments which have been informed and evidenced by in-country ratios internationally (i.e. more "scientifically" as in Table 6 and Table 7), but also "as an art" drawing from the South African context (as per the derivation of some of the ratios).

Benchmarked Countries

	Reserve price (Rm)	Auction price (Rm)
Austral., 1998, 800MHz, 1998	81.72	266.58
Austral., 2013, 700MHz, 2013	1155.11	
Austral., 2017, 700MHz, 2017		1617.38
Austria, 2002, 900MHz, 2002	225.58	225.58
Austria, 2004, 900MHz, 2004	10.65	12.43
Austria, 2008, 900MHz, 2008	11.11	90.73
Brazil, 2007, 800MHz, 2007	275.6	721.26
Chile, 2014, 700MHz, 2014		64.52
Denmark, 2010, 900MHz, 2010	55.44	55.44
Denmark, 2012, 800MHz, 2012	113.31	252.2
Denmark, 2019, 700MHz, 2019	220.94	
Denmark, 2019, 900MHz, 2019	220.94	
France, 2011, 800MHz, 2011	789.15	1156
Germany, 2010, 800MHz, 2010	5.92	1455.05
Germany, 2015, 700MHz, 2015	138.66	308.28
Germany, 2015, 900MHz, 2015	138.66	355.42
Greece, 2011, 800MHz, 2011		1414.35
Greece, 2011, 900MHz, 2011	1411.29	
Greece, 2014, 800MHz, 2014		1605.77
HK, 2011, 900MHz, 2011	129.14	3622.38
HK, 2019, 900MHz, 2019		1013.18
Ireland, 2001, 900MHz, 2001	346.26	383.3
Ireland, 2012, 800MHz, 2012	623.09	
Ireland, 2012, 900MHz, 2012	623.09	
Italy, 2011, 800MHz, 2011	1160.8	1621.19
Italy, 2018, 700MHz, 2018		1057.11
Kenya, 2016, 800MHz, 2016	999.71	999.71
Korea, 2011, 800MHz, 2011	1628.88	1628.88
NZ, 2002, 900MHz, 2002	44.45	46.79
Nether., 2012, 800MHz, 2012	320.44	734.42

Nether., 2012, 900MHz, 2012	265.02	
Nigeria, 2007, 800MHz, 2007	2069.02	2069.02
Norway, 2017, 900MHz, 2017	234.55	330.98
Norway, 2019, 700MHz, 2019	49.75	156.36
Portugal, 2011, 800MHz, 2011	1584	1584
Portugal, 2011, 900MHz, 2011	1056	1056
Romania, 2012, 800MHz, 2012	1388.37	
Romania, 2012, 900MHz, 2012	1587.32	1587.32
Singap., 2008, 900MHz, 2008	34.54	34.54
Spain, 2011, 800MHz, 2011	947.2	1212.81
Spain, 2011, 900MHz, 2011	979.77	979.77
Sweden, 2011, 800MHz, 2011	208.14	475.5
Switz., 2012, 800MHz, 2012	191.08	
Switz., 2012, 900MHz, 2012	196.74	
Switz., 2018, 700MHz, 2018	133.73	
Tanzan., 2018, 700MHz, 2018	230.59	461.3
UK, 2013, 800MHz, 2013	699.45	699.45
UK, 2019, 700MHz, 2019	40.52	
US, 2002, 700MHz, 2002	38.72	77.43
US, 2003, 700MHz, 2003	15.73	55.77
US, 2005, 700MHz, 2005	27.66	230.05
US, 2008, 700MHz, 2008	82.22	1638.12
US, 2011, 700MHz, 2011	76.84	866.06
Average	486.53	834.69
Number of observations	47	41

	Reserve price (Rm)	Auction price (Rm)
Austral., 1998, 1800MHz, 1998	81.72	149.83
Austral., 1998, 2, 1800MHz, 1998	132.32	140.1
Austral., 2000, 1800MHz, 2000	173.01	1910.81
Austral., 2013, 2600MHz, 2013	25.63	25.63
Austral., 2016, 1800MHz, 2016		150.91
Austria, 1997, 1800MHz, 1997	0	1277.62
Austria, 1999, 1800MHz, 1999	0	745.29
Austria, 2001, 1800MHz, 2001	391.59	391.59
Austria, 2004, 1800MHz, 2004	10.65	10.65
Austria, 2010, 2600MHz, 2010	7.32	49.43
Austria, 2019, 3500MHz, 2019		66.29
Belgium, 2011, 2600MHz, 2011	118.98	118.98
Brazil, 2007, 1800MHz, 2007	240.42	
Brazil, 2007, 2, 1800MHz, 2007	58.64	58.64
Bulgaria, 2008, 1800MHz, 2008	2979.16	2979.16
Canada, 2001, 1800MHz, 2001	165.39	793.87
Denmark, 2010, 2600MHz, 2010	19.67	262.89
Denmark, 2012, 1800MHz, 2012	23.76	23.76
Denmark, 2016, 1800MHz, 2016	65.63	207.1

	Reserve price (Rm)	Auction price (Rm)
Denmark, 2019, 2300MHz, 2019	58.14	
Finland, 2009, 2600MHz, 2009	1.97	1.97
Finland, 2018, 3500MHz, 2018		50.97
Georgia, 2006, 1800MHz, 2006	1807.36	4150.69
Germany, 1999, 1800MHz, 1999	7.33	315.23
Germany, 2010, 1800MHz, 2010	5.92	51.33
Germany, 2010, 2600MHz, 2010	5.92	5.92
Germany, 2015, 1800MHz, 2015	69.33	444.73
Germany, 2019, 3500MHz, 2019		220.03
Greece, 2001, 1800MHz, 2001	555.07	555.07
Greece, 2011, 1800MHz, 2011	620.11	620.11
Greece, 2014, 2600MHz, 2014		129.18
HK, 2009, 1800MHz, 2009	379.79	582.46
HK, 2009, 2600MHz, 2009	199.26	654
HK, 2012, 2300MHz, 2012		140.42
HK, 2013, 2600MHz, 2013		797.98
HK, 2019, 1800MHz, 2019		896.52
HK, 2019, 3500MHz, 2019		95.08
Ireland, 2017, 3500MHz, 2017	13.4	
Israel, 2001, 1800MHz, 2001	788.83	788.83
Italy, 2011, 1800MHz, 2011	512.76	521.49
Italy, 2011, 2600MHz, 2011	100.37	117.83
Italy, 2019, 3500MHz, 2019		647.81
Korea, 2011, 1800MHz, 2011	1388.52	3104.34
Korea, 2018, 3500MHz, 2018		304.13
Mexico, 2010, 1800MHz, 2010	40.31	544.21
NZ, 2001, 1800MHz, 2001	0	207.33
Nether., 1998, 1800MHz, 1998	0	489.37
Nether., 2010, 2600MHz, 2010	6.83	6.83
Nigeria, 2013, 2300MHz, 2013	82.48	82.48
Nigeria, 2016, 2600MHz, 2016	218.8	218.8
Norway, 2001, 1800MHz, 2001	149.84	149.84
Norway, 2007, 2600MHz, 2007	2.64	25.06
Portugal, 2011, 1800MHz, 2011	137.22	137.22
Portugal, 2011, 2600MHz, 2011	104.41	104.41
Romania, 2012, 2600MHz, 2012	160.03	
Singap., 2001, 1800MHz, 2001	6.39	6.39
Singap., 2009, 1800MHz, 2009	34.52	34.52
Singap., 2011, 1800MHz, 2011	31.51	630.15
Spain, 2011, 2600MHz, 2011	27.56	120.28
Spain, 2018, 3500MHz, 2018		99.99
Sweden, 2008, 2600MHz, 2008	5.47	258.83
Sweden, 2011, 1800MHz, 2011	14.35	276.33
Switz., 2012, 2600MHz, 2012	70.77	
Switz., 2018, 2600MHz, 2018	46.17	
UK, 2013, 2600MHz, 2013	28.23	125.3

	Reserve price (Rm)	Auction price (Rm)
UK, 2018, 2300MHz, 2018	25.65	878.3
UK, 2018, 3500MHz, 2018	5.13	35.2
US, 1995, 1800MHz, 1995	0	998.15
US, 1996, 1800MHz, 1996	0	2274.6
US, 1996, 2, 1800MHz, 1996	0	4549.2
US, 1997, 1800MHz, 1997	0	618.02
US, 1999, 1800MHz, 1999	67.01	177.31
US, 2005, 1800MHz, 2005	39.31	1004.63
US, 2007, 1800MHz, 2007	96.78	482.35
US, 2008, 1800MHz, 2008	42.69	
Average	197.65	574.91
Number of observations	63	68

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