GOVERNMENT OF BERMUDA

Ministry of Education & Economic Development

Spectrum Policy Statement

By

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1 EXECUTIVE SUMMARY

1.1 Purpose

1. The Minister of Education and Economic Development ("MEED"), Dr. the Hon. E Grant Gibbons, JP, MP, as the Minister responsible for Telecommunications ("Minister"), is required by Section 35 of the Electronic Communications Act 2011 to make general policies and, as necessary, regulations for the electronic communications sector with respect to:

   (a) the management and allocation of spectrum; and

   (b) the procedure to be followed by the Regulatory Authority in assigning spectrum.

2. The purpose of this Policy Statement (hereafter: "Statement") is to provide the spectrum management policies for the Regulatory Authority ("RA" or "Authority") to implement going forward with respect to spectrum allocations, spectrum assignments, and spectrum related fees. The effective date of the policies contained in this Statement is 22 September 2014.

3. In this document, except insofar as the context otherwise requires, words or expressions shall have the meaning assigned to them by the Regulatory Authority Act 2011 ("RAA"), the Electronic Communications Act 2011 ("ECA"), and Interpretation Act 1951.

1.2 Acknowledgment

4. The Minister would like thank the Regulatory Authority for its cooperation and efforts in the drafting of the Ministry of Education and Economic Development's Spectrum Policy Consultation Document and the development of this Statement. The coordination between the staffs of the Regulatory Authority and Ministry in these matters was invaluable and provided the Minister with detailed information and analysis to consider when making this initial Statement under the framework of the ECA and RAA. The Minister looks forward to the continued cooperation between the Ministry and the Regulatory Authority in meeting the regulatory needs of the communications industry in Bermuda.

2 INTRODUCTION

2.1 Legislative Context

5. In carrying out functions related to spectrum policy and management the Minister and the Authority are required to give regard to the purposes of the ECA. These purposes as set out in ECA Section 5(1) are to:

   (a) ensure that the people of Bermuda are provided with reliable and affordable access to quality electronic communications services;

   (b) enhance Bermuda's competitiveness in the area of electronic communications so that Bermuda is well-positioned to compete in the international business and global tourism markets;

   (c) encourage the development of an electronic communications sector that is responsive to the requirements of users (both individuals and businesses) and provides them with choice, innovation, efficiency and affordability;

   (d) encourage the development and rapid migration of innovative electronic communications technologies to Bermuda;

   (e) promote the orderly development of Bermuda's electronic communications sector;

   (f) encourage sustainable competition and create an invigorated electronic communications sector that will lay the groundwork for the further development of communications-reliant industries;

   (g) encourage the development and maintenance of resilient and fault-tolerant communications infrastructures;

   (h) promote investment in the electronic communications sector and in communications-reliant industries, thereby stimulating the economy and employment; and

   (i) promote Bermudian ownership and Bermudian employment at all levels of the electronic communications sector.

6. According to ECA Section 5(2):

   > *Where any of these purposes appear to be in conflict, the priorities shall be set or the conflict otherwise resolved in a way that best serves the public interest in the opinion of the Minister or the Authority, as the case may be.*

7. ECA Section 37 sets out the seven objectives of spectrum management (hereafter: "Spectrum Management Objectives"). In particular, ECA Section 37 requires that the Minister and the Authority ensure that radio spectrum is managed in a manner that—

   (a) is objective, transparent and non-discriminatory;

   (b) is economically and technically efficient;

   (c) facilitates the introduction and evolution of new technologies and innovative electronic communications services;

   (d) gives due recognition to the level of investment in existing equipment configured for specific frequencies and the cost of migrating to other frequencies;

   (e) preserves or promotes effective and sustainable competition in the provision of electronic communications services subject to this Act;

   (f) is compatible with the Convention; and

   (g) meets the radiocommunications needs of Government Departments and agencies.

2.1.1 Role of the Minister Responsible for Telecommunications

8. Under ECA Section 6, the Minister responsible for telecommunications:

> *…shall have the power to establish general policies and to make regulations for the electronic communications sector, in accordance with sections 4 and 5 of the Regulatory Authority Act 2011, with respect to—*
>
> *…*
>
> *c) management of the radio spectrum as provided in Part 7;*

9. ECA Part 7 addresses the use of radio spectrum and equipment for electronic communications and requires the Minister to determine policy regarding the management and allocation of spectrum and the procedures to be followed by the Authority in assigning spectrum. In particular, ECA Section 35 states that:

> *(1) The Minister, giving due regard to the purposes and objectives of this Act and the importance of radio spectrum as a scarce national resource and a public good of significant social, cultural and economic value, shall make general policies and, as necessary, regulations for the electronic communications sector with respect to—*
>
> *(a) the management and allocation of spectrum for particular or liberalised uses in accordance with the provisions of this Act; and*
>
> *(b) the procedures to be followed by the Authority in the assignment of spectrum for use in connection with the provision of electronic communications, whether by means of the grant of an individual licence, the designation of a class licence, or the grant of a licence exemption.*
>
> *(2) The Minister shall confer and coordinate with any Government Department or agency that has recognised spectrum usage rights prior to adopting any policies or issuing any directions that could affect such rights.*[1] *[footnote added]*

10. RAA Section 4 addresses the Functions of Minister and Ministerial declarations. Specifically, RAA Section 4 states that:

> *(1) A Minister shall have those functions, in respect of a regulated industry sector for which he is responsible, that are specified in this Act and in sectoral legislation.*
>
> *(2) When provided for in sectoral legislation, a Minister may issue Ministerial declarations that establish policies for a regulated industry sector.*
>
> *(3) When adopting a Ministerial declaration, a Minister shall—*
>
> *(a) confer with the Authority when developing policies applicable to a regulated industry sector; and*
>
> *(b) consult with sectoral participants.*
>
> *(4) Any Ministerial declaration made by a Minister pursuant to this section shall remain in effect until the earlier of—*
>
> *(a) any date specified in the Ministerial declaration; or*
>
> *(b) the date on which the Minister modifies or revokes the Ministerial declaration.*

[1] The Minister notes that while Government Departments or agencies with recognised spectrum usage rights were not prohibited from participating in the consultation process, separate conferences and coordination was determined to be unnecessary as the policies addressed in this Statement do not affect such rights.

2.1.1.1 Delegation of Functions to the Authority

11. RAA Section 9(1) provides that a Minister responsible for a regulated industry sector may, in writing, delegate to the Authority, either generally or for a particular occasion, any function of the Minister regarding the regulated industry sector for which he is responsible, provided that:

    (a) no delegation made under this section shall preclude the Minister from exercising or performing, at any time, any of the functions so delegated;

    (b) the Authority may not delegate to any person any function that the Minister has delegated to it under this section; and

    (c) the Minister may, in writing, revoke or modify such delegation at any time.

2.1.2 Role of the Regulatory Authority

12. ECA Section 36 (1) requires the Authority to implement the policies and regulations made by the Minister. ECA Section 36 (2) gives the Authority the power to carry out numerous functions in respect radio spectrum. Of most relevance to the current consultation is that ECA Section 36(2) gives the Authority the power to:

    (a) specify the criteria and procedures for the assignment of radio frequencies, awarding individual spectrum licences, establishing spectrum class licences and granting licence exemptions (Section 36(2)(b));

    (b) establish the applicable licence terms and conditions, including technical conditions and usage priorities and limitations (Section 36(2)(c));

    (c) coordinate licensing procedures and conditions with associated operating licences for the provision of electronic communications (Section 36(2)(d)); and

    (d) conduct comparative selection processes, auctions, lotteries or hybrid processes for the award of spectrum licences in cases where demand for the right to use a specific portion of the radio spectrum is expected to exceed supply (Section 36(2)(e));

13. RAA Section 16(d) states that "In performing its duties under this Act, the Authority shall act in a reasonable, proportionate and consistent manner". ECA Section 2 defines the term proportionate as "no more than reasonably necessary to achieve a given regulatory objective, taking into account the relative cost of compliance and the ultimate benefit to consumers."

2.1.3 Spectrum Related Fees

14. ECA Section 40 provides a number of criteria that apply in respect of government authorization fees for specified types of spectrum licences. For example, it requires that the fees applicable for the use of spectrum suitable for similar types of radiocommunications services shall be set in a reasonable, objective and transparent manner. It also specifies that in order to optimise the use of spectrum, competitive bidding procedures, subject to a minimum reserve price, shall be used where practicable where the level of demand for a particular type of frequency or band of frequencies is expected to exceed the spectrum. However, ECA Section 40(c) also recognises that spectrum licences or permits for radio stations and apparatus may be granted other than on the basis of competitive bidding procedures, in which case fees shall be imposed that reflect —

    (i) a reasonable measure of the value of the spectrum assigned, based on an assessment of the opportunity costs of the current use and other potential uses of a particular frequency or frequency band; or

    (ii) relevant benchmarks or other appropriate proxies where the information required to assess the value stipulated in subparagraph (i) is not reasonably available.

2.1.4 Procedural History

15. On 17 April 2014 the Regulatory Authority published the Minister of Education and Economic Development's Spectrum Policy Consultation Document ("MEED Consultation Document' or "Consultation")

    (a) On 16 May 2014, BDC responded to the MEED Consultation Document;

    (b) On 23 May 2014, Digicel responded to the MEED Consultation Document; and

    (c) On 16 May 2014, LinkBermuda Ltd. and Quantum Communications Limited (hereafter: "Link") provided a joint response to the MEED Consultation Document.

3 SPECTRUM MANAGEMENT

3.1 High Demand Spectrum

16. RAA Section 16(d) states that "In performing its duties under this Act, the Authority shall act in a reasonable, proportionate and consistent manner". ECA Section 2 defines the term proportionate as "no more than reasonably necessary to achieve a given regulatory objective, taking into account the relative cost of compliance and the ultimate benefit to consumers."

17. Given these guidelines the RA determined in the SEUSA Proceeding[2] that it was reasonable to limit the scope of its investigation to "high value" spectrum assignments, where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest. The Minister agreed with the Regulatory Authority's general approach in that proceeding and tentatively concluded that this approach should be implemented as spectrum management policy going forward. As such, the Minister proposed that the Regulatory Authority be required to define, through a General Determination, a set of frequencies where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest. The defined High Demand Spectrum ("HDS") may then be subjected to more stringent spectrum management procedures with respect to assignments and fees.[3] The Minister found this approach to be reasonable, proportionate, and consistent with the requirement of ECA Section 37(1)(a) to ensure that radio spectrum is managed in a manner that is objective, transparent and non-discriminatory.

18. Respondents were asked if they agreed that it was reasonable and proportionate for the Regulatory Authority to define "High Demand Spectrum" and subject it to more stringent spectrum management procedures with respect to allocations, assignments, and fees.[4]

19. While not directly responding to this proposal the sum of the comments received generally supported the Minister's proposal. As such, and seeing no reason to revise his tentative conclusion, the Minister hereby determines that the Regulatory Authority shall be required to define, through a General Determination, a table containing a set of frequencies where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest. The defined High Demand Spectrum ("HDS") may then be subjected to more stringent spectrum management procedures with respect to assignments and fees. The Minister finds this approach to be reasonable, proportionate, and consistent with the requirement of ECA Section 37(1)(a) to ensure that radio spectrum is managed in a manner that is objective, transparent and non-discriminatory.

20. After conferring with the Regulatory Authority the Minister opined that the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest for the frequencies shown below in Table 1. Therefore, the Minister proposed that the Regulatory Authority define the following frequencies as HDS frequencies:

[2] See SEUSA Consultation Document at para. 21; available at: http://rab.bm/images/PDF/Transitional%20Spectrum%20Investigation%202013.pdf

[3] For example, as proposed below, non-HDS frequencies would continue to be assigned on a first come first served basis while HDS assignments would be subject to the procedures proposed in Section **Error! Reference source not found.**. Fees associated with non-HDS assignments will be addressed at a later date.

[4] See Consultation Question 1.

Table 1: Proposed High Demand Spectrum

HDS BAND NAME	FREQUENCY RANGE	HDS BAND SIZE
700 MHz Band	698 to 806 MHz	108 MHz
850 MHz Band	824 to 849 MHz 869 to 894 MHz	50 MHz
1900 MHz Band	1850 to 1910 MHz 1930 to 1990 MHz	120 MHz
2100 MHz Band	1710 to 1755 MHz 2110 to 2155 MHz	90 MHz
2500 MHz Band	2496 to 2690 MHz	194 MHz
3500 MHz Band	3300 to 3700 MHz	400 MHz[5]

21. Respondents were asked if they agreed that the frequencies shown in Table 1 were those where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest. Respondents were also asked to explain which frequency ranges should be added and/or deleted from the definition of HDS frequencies.[6]

22. BDC argued that the suitability and availability of spectrum for Commercial Mobile Radio Service ("CMRS") is the critical factor in determining the frequencies which are HDS. Based on this selection criteria BDC recommended that two spectrum bands should be added to the table:

    (a) 600 MHz Band. BDC asserted that in the US the FCC is considering reallocating up to 84 MHz of 600 MHz spectrum to CMRS in recognition of the value of, and demand for, additional spectrum under 1 GHz. BDC recommended that this band be added to the HDS Table and designated as future High Demand Spectrum.

    (b) SMR Band. BDC asserted that US Specialized Mobile Radio ("SMR") spectrum in the 800 MHz band should also be added and designated as High Demand Spectrum. BDC claimed that this band is being employed to launch LTE service.

23. According to BDC, the addition of these spectrum bands not only makes the HDS Table more complete but also is consistent with the approach in other countries that are actively identifying additional spectrum below 1 GHz that can be made available for CMRS.

[5] We note that this was incorrectly shown as 4 GHz in the MEED Consultation. The correct band size is 400 MHz or 0.4 GHz.

[6] See Consultation Question 2.

24. BDC also recommended that the 3500 MHz band be removed from the HDS Table because it is currently used in Bermuda for commercial fixed broadband wireless services and is not yet widely utilized for mobile. However, BDC noted that at some time in the future it will naturally be suitable and available for CMRS and could be included in the HDS Table at that time. In this respect, BDC urged the Minister to view the designation of HDS frequencies as fluid. BDC argued that over time, technology, consumer demand and even allocation decisions of the RA will modify whether particular spectrum is suitable and available for CMRS use and the RA should be permitted to revisit its thinking on HDS bands and whether and how they are regulated.

25. The Minister declines BDC's request to add 600 MHz Band to the HDS Table[7] at this time because this spectrum is not available for reallocation or reassignment given the WOW migration proceeding and, more importantly, because the FCC auction for this spectrum is only planned for mid-2015 and the post auction transition is scheduled to take up to 39 months.[8] Thus, the Minister is not certain that equipment will become available for use in Bermuda in the near term. While BDC noted the potential of this spectrum, BDC offered no information regarding the timing of equipment availability. Given that the Regulatory Authority is in the process of migrating WOW from the 700 MHz band (where CMRS equipment is readily available) to the 600 MHz Band (where the timeline for equipment availability is unknown) the Minister does not find it necessary, at this time, for the Regulatory Authority to designate the 600 MHz Band in the HDS Table and/or revise its allocation in the Bermuda Frequency Allocation Table ("FAT"). However, the Minister agrees, for the reasons noted by BDC, that the Regulatory Authority should revisit this issue as time passes and market conditions change. As such, the Minister determines that the Regulatory Authority shall, from time to time, upon request or its own motion, revise the HDS Table based on the market conditions in Bermuda and other jurisdictions, such as the United States ("US"), that have important strong geographical and wireless roaming synergies with Bermuda. The Minister is of the opinion that this policy grants the Regulatory Authority the necessary latitude to efficiently define the HDS Bands and whether and how the defined bands are to be regulated. The Minister believes that this policy is sufficient to address the SMR spectrum in the 850 MHz Band as well,[9] so its inclusion in the HDS Table is not required at this time.

26. Regarding the 3500 MHz spectrum the Minister does not agree with BDC that this spectrum should be removed from the HDS Table. BDC's only argument in support of its proposal is that this spectrum is used for commercial fixed broadband wireless services in Bermuda and that it is not yet widely utilized for mobile services. The fact that this spectrum is not widely used for CMRS is not dispositive. The purpose of defining HDS frequencies is to focus the Regulatory Authority's attention and resources on the set of frequencies where the potential for demand to exceed supply and the need to ensure efficient spectrum assignments are the greatest so that these frequencies may be subjected to more stringent spectrum management procedures with respect to assignments and fees. It was never the Minister's intent to limit entries in the HDS Table to the spectrum used for CMRS. Furthermore, based on the past experience of the Department of Telecommunications ("DoT"), and after conferring with the Regulatory Authority, the Minister has been made aware that there was, and is, greater interest in the HDS frequencies proposed by the Minister, including the 3500 MHz Band. BDC's request is therefore denied.

[7] See Appendix A – HIGH DEMAND SPECTRUM TABLE.

[8] Assuming a June 2015 auction date the transition in the US may not be complete until after September 2018.

[9] The Minister notes that this SMR spectrum is currently assigned to Telecommunications Networks Limited as part of its Other Mobile Radio Service Spectrum License. This spectrum was specifically excluded from the ECA Section 78 Transitional Spectrum Investigation conducted by the Regulatory Authority.

27. Digicel agreed that the frequencies listed in the HDS Table were in demand and made two general recommendations. First, that Government should free up vast quantities of additional spectrum for mobile use so that supply is greater than demand, and thus, fewer frequencies would be listed in HDS Table. Digicel provided a table of some of the possible frequencies that could be made available in this regard. The table provided by Digicel is an adaptation of a table prepared by Ofcom which "sets out the state of play for spectrum bands that are likely to feature in forthcoming international discussions of wireless broadband...[including] whether the band is likely to be considered in the preparatory work for WRC-15, and whether it is already allocated to mobile broadband services."[10] Second, that Government make it easier for firms to locate transceivers for mobile services, including making existing infrastructure under the control of the Government available for cell site location.

28. The Minister notes that the specific frequencies in the table provided by Digicel are not relevant to Bermuda as they relate to the expectations for Europe (International Telecommunication Union ("ITU") Region 1) while Bermuda is located in a different region (ITU Region 2, along with the US) whose frequency allocations are not identical. That said, the Minister agrees that the Regulatory Authority's approach should be forward looking and take into account what the other regulatory agencies, such as the ITU and the US Federal Communications Commission ("FCC"), are considering regarding spectrum allocations.

29. The Minister understands Digicel's concern regarding the wireless industry's access to support infrastructure. However, while the Minister responsible for Telecommunications has jurisdiction over the technical standards of the equipment placed on structures, the Minister has no authority over the land used or the structures themselves as these are rightly the concerns of other ministries, such as:

    (a) Department of Planning (Ministry of Home Affairs);

    (b) Department of Health (Ministry of Health, Seniors & Environment);

    (c) Department of Airport Operations (Ministry of Tourism Development and Transport); and

    (d) Department of Public Lands and Buildings, Land Surveys and Registration (Ministry of Public Works).

30. As such, the Minister believes that determinations regarding access to support structures are best handled on a case by case basis by the relevant Ministries so that each decision can be tailored to reflect the specific circumstances of each request.

3.2 Spectrum Allocations and Band Plans

31. The International Telecommunication Union ("ITU"), is the United Nations' specialized agency for information and communication technologies and is "a forum for governments and the private sector to coordinate technical and policy matters related to global telecommunications networks and services."[11] The ITU, *inter alia*, establishes the global framework for the use of radio frequencies (or spectrum) in the ITU Radio Regulations – a treaty ratified by the Member States of the ITU.[12]

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[10] Spectrum management strategy: Ofcom's approach to and priorities for spectrum management over the next ten years, published 2 October 2013, at para. 6.15. See also Table 5 on page 67. Available at: http://stakeholders.ofcom.org.uk/binaries/consultations/spectrum-management-strategy/summary/spectrum_management_strategy.pdf

[11] See: http://www.tiaonline.org/policy/trade/international-telecommunication-union-itu

[12] Bermuda is a British Overseas Territory, and as such, is not a member state in the ITU and may only achieve representation through OFCOM, the independent telecommunications regulator and competition authority for the United Kingdom.

32. The ITU has divided the world into three regions for the purpose of allocating spectrum; that is, designating radio frequencies for use by one or more terrestrial or space radiocommunication services.[13] Bermuda is situated in ITU Region 2, along with the Americas, Greenland, and some eastern Pacific Islands.

33. The ITU conducts a World Radiocommunication Conference ("WRC") every three to four years to review, and, if necessary, revise the Radio Regulations. The Radio Regulations include allocations and technical rules for spectrum use in each of the three defined regions. ITU allocations are designated as either primary or secondary:

    (a) **Primary allocations** grant the specified services priority in using the allocated spectrum. If there are multiple primary services they all have equal rights to the spectrum except that an existing station has the right to be protected from other stations that begin operation at a later date. Primary allocations are represented in the allocation table in 'UPPER CASE'; e.g. "MOBILE" or "BROADCASTING".

    (b) **Secondary allocations** are made for services that must protect all primary allocations in the same band. That is, services operating in secondary allocations must not cause harmful interference to, and must accept interference from, primary service stations. All secondary service stations have equal rights among themselves in the same frequency band. Secondary allocations are represented in the allocation table in 'Title Case'; e.g. "Mobile" or "Broadcasting'.

34. Within the global framework established by the ITU, individual countries are permitted to deviate from the ITU allocations, if the need arises, when establishing its national Frequency Allocation Table ("FAT") and band plans.[14] However, the adoption of allocations or band plans that are not harmonized with other jurisdictions can result in the following:

    (a) **Lack of vendor support and interoperability**: Spectrum fragmentation increases the complexity of designing telecoms equipment. This can increase the cost of network infrastructure (including spare parts and maintenance expertise) and reduce the availability of compatible equipment (such as handsets) for consumers.

    (b) **Increased service cost to consumers**: Unless prevented by competition, service providers are likely to pass the equipment costs to subscribers in the form of high service tariffs.

    (c) **Regional roaming becomes difficult**: Non-harmonisation can negatively impact the attractiveness of a country for multi-national companies and tourism if international roaming is difficult or impossible.

    (d) **Border co-ordination**: Part of the spectrum may become unusable in border areas, where band plans overlap, and which degrades the level of mobile and other services available in border regions.[15]

35. A Bermuda FAT has not yet been established; however, when assigning spectrum the DoT, and subsequently the Regulatory Authority, has generally followed the FAT and band plans established by the FCC.

[13] Spectrum may also be allocated to radio astronomy service under specified conditions.

[14] While allocations describe the services a given frequency range may be used to provide, the band plan describes how a frequency range is divided into blocks that may be assigned to a party to provide said service(s).

[15] See: http://www.analysysmason.com/About-Us/News/Insight/700MHz-band-planning-Sept2012/

36. In the 2009 Spectrum Consultation[16] parties were asked if Bermuda should consider adopting non-harmonized allocations and band plans.[17] Respondents generally agreed that it did not make sense to deviate from international conventions (e.g. the ITU), and in particular, the band plans established by FCC. The Minister agreed and stated that it was in the best interest of Bermuda to continue to follow the FCC's frequency allocations and band plans as much as practicable so that Bermuda may benefit from the interoperability of, and all available economies of scale for, radiocommunications equipment.

37. The Minister found this approach to be consistent with the requirements of ECA Section 37(1), and in particular, subsections (a) – (c) which require that radio spectrum is managed in a manner that:

    (a) is objective, transparent and non-discriminatory;

    (b) is economically and technically efficient;

    (c) facilitates the introduction and evolution of new technologies and innovative electronic communications services;

38. ECA Section 35 requires the Minister to establish general policies and, as necessary, regulations with respect to the management and allocation of spectrum. As such, the Minister proposed to establish a Bermuda FAT for HDS frequencies based on the FCC's frequency allocations. The Minister proposed to address the allocation of non-HDS frequencies at a later date, or as the need arises. Furthermore, for each of the frequencies in the Bermuda FAT the Minister proposed to establish a Bermuda band plan ("BBP") based on the band plans adopted by the FCC.

39. Regarding allocations and band plans, Respondents were asked if:[18]

    (a) they agreed that the Minister should establish a Bermuda FAT for HDS frequencies based on the FCC's frequency allocations;

    (b) they agreed that the Minister should establish a BBP, based on the band plans adopted by the FCC, for each of the frequencies in the Bermuda FAT;

    (c) there were instances, either general or specific, in which Bermuda would benefit by varying its frequency allocations and/or band plans from those adopted by the FCC; and

    (d) they agreed with the Minister's proposal to address the allocation of non-HDS frequencies at a later date.

40. BDC and Digicel agreed that the allocations and band plans for the HDS frequencies should follow FCC definitions as this would minimize infrastructure and Customer-Provided Equipment ("CPE") costs while maximizing the compatibility of equipment.

[16] The 2009 Spectrum Consultation was issued by the DoT. See: http://www.gov.bm/portal/server.pt/gateway/PTARGS_0_2_7286_330_1813_43/http%3B/ptpublisher.gov.bm%3B7087/publishedcontent/publish/min__telecom__and_e_commerce/telecommunications/telecommunication_regulatory_reform/spectrum_consultation_document_june_2009_0.pdf

[17] See 2009 Spectrum Consultation, Questions 26 – 28.

[18] Consultation Questions 3-6.

41. BDC did not think Bermuda would benefit by varying its frequency allocations and/or band plans from the FCC's as Bermuda has strong geographical and wireless roaming synergies with the US and North America. BDC asserted that following the FCC band plans makes terminal interoperability and service delivery easier and more efficient.

42. Digicel agreed that the non-HDS bands were not a priority so their allocations and band plans could be addressed at a later date. However, BDC disagreed with the proposal to address the allocation of non-HDS bands at a later date and requested that the Regulatory Authority be required to articulate rules that have general applicability that can be applied across all spectrum bands as soon as possible. BDC argued that delaying the allocation of non-HDS spectrum to a later date creates uncertainty and has resulted in practical technical issues in other markets that did so. For example, BDC argued that non-harmonized bands may result in uplink or downlink conflicts with the FCC band plan that will hinder rapid deployment of services in Bermuda.

43. BDC noted that the FCC recently resolved a multi-year conflict that delayed deployment of some 700 MHz frequencies because the agency failed to provide certainty as to band classes in those frequencies. BDC claimed that Bermuda can avoid such a result by addressing all practicable allocation issues now.

44. The Minister understands BDC's concerns regarding uncertainty and non-harmonized bandplans but disagrees with the proposal to require the Regulatory Authority to articulate rules that have general applicability that can be applied across all spectrum bands at this time. The Minister previously noted that historically the DoT and the Regulatory Authority have generally followed the FCC's lead regarding allocations and bandplans, and in the Consultation Document the Minister proposed that the Regulatory Authority should continue to follow the FCC's frequency allocations and band plans as much as practicable as it is in Bermuda's best interest to benefit from the interoperability of, and all available economies of scale for, radiocommunications equipment.

45. As general policy the Minister determines that the Regulatory Authority shall maintain and publish the Bermuda FAT and BBP in a manner consistent with ECA Section 36(2)(a), and shall, to the greatest extent practical, seek to coordinate the allocations contained therein with the allocations established by the FCC. The Minister defers to the expertise of the Regulatory Authority to determine if and when to revise the Bermuda FAT and BBP to comply with this policy. The Minister is of the opinion that this decisions is generally applicable, and sufficient, to mitigate the concerns expressed by BDC without requiring the Regulatory Authority to develop additional rules at this time. The Minister defers to the expertise of the Regulatory Authority to determine if and when non-HDS frequencies should be added to the Bermuda FAT and BPP.

46. Furthermore, the Minister notes that the example provided by BDC regarding issues with the 700 MHz Band could not be resolved in Bermuda, and would remain a problematic issue until addressed by the FCC because the Bermuda marketplace is dependent upon the equipment developed for the US market.[19] Since this issue has been resolved by the FCC it is no longer an issue in Bermuda.

47. The Minister's specific allocation and band plan determinations for each of the defined HDS frequencies are discussed in more detail in the following section, beginning with the 700 MHz band.

[19] Had the Regulatory Authority 'solved' the band class issue noted by BDC prior to the FCC doing so would have done nothing to speed up the availability of handsets or the deployment of equipment for the frequencies in question because this equipment is developed for the US market based on the rulings of the FCC and/or the equipment specifications made by large firms such as AT&T and Verizon.

3.2.1 700 MHz Band

3.2.1.1 Background

48. The 700MHz band is currently in use in Bermuda for the provision of terrestrial television broadcast services. World On Wireless ("WOW") holds rights to spectrum in the range of 614-806 MHz which it uses to provide digital terrestrial television. However, in numerous other jurisdictions, the 700 MHz band has been made available for 'refarming'[20] as a result of the increased spectrum efficiency associated with the switchover from analogue to digital television services (and is hence often referred to as the "Digital Dividend"). The use of the 700 MHz band for provision of mobile broadband services is broadly viewed as providing the potential for very significant economic benefits. This is particularly the case given the context of exponential growth in data traffic which results in a need to provide further spectrum for provision of mobile broadband services.[21]

49. Two specific features of the 700 MHz spectrum band that make it well-suited for provision of mobile broadband services are that its propagation characteristics are such that:

    (a) it provides coverage to wider areas than the use of higher frequency spectrum resulting in a lower number of cell-sites required to supply service to a given area; and

    (b) it allows improved in-building coverage because relatively lower frequencies can more easily penetrate buildings.

    As a result, governments and regulatory bodies internationally have typically concluded mobile broadband is a superior use for the 700 MHz band.

50. In Bermuda, given there are no large sparsely populated areas, point (a) above may be less applicable than in many other countries.[22] However, there are significant benefits to be achieved from using the 700 MHz band to provide improved indoor LTE coverage and to address growth in demand for data services.[23]

3.2.1.2 Allocation

51. The frequencies in the range from 698 MHz to 806 MHz shall be defined as the 700 MHz band. The FCC allocation for this band is to FIXED, MOBILE, and BROADCASTING, which is consistent with the ITU Region 2 allocation.

52. The Minister proposed to allocate the 700 MHz band to FIXED, MOBILE, and BROADCASTING in the Bermuda FAT. Respondents were asked if they agreed with the Minister's proposed allocations for the 700 MHz band. Both BDC and Digicel agreed. As such, and seeing no reason to revise his tentative conclusion, the Minister hereby directs the Regulatory Authority to allocate the 700 MHz band to FIXED, MOBILE, and BROADCASTING in the Bermuda FAT.

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[20] The term refarming refers to re-allocating (and often re-assigning) frequencies for use by a different type of service.

[21] For example, see: http://www.cisco.com/c/en/us/solutions/collateral/service-provider/visual-networking-index-vni/white_paper_c11-520862.html

[22] That said, the current restrictions on new purpose built cell towers may increase the need for wider coverage areas.

[23] Long Term Evolution or "LTE" is an IP (Internet Protocol) based fourth generation ("4G") mobile communication standard that allows for high speed mobile data services. We note that LTE networks will provide more than data service in the near future as in the US both AT&T and Verizon Wireless are testing mobile handsets that implement voice over LTE ("VoLTE") technology.

3.2.1.3 Band Plan

53. In order for the 700 MHz band to be refarmed it is necessary to determine a suitable band plan. Central to selecting the most suitable band plan for Bermuda is harmonisation with other jurisdictions. The small scale of Bermuda dictates a need to have spectrum policy that is aligned with other jurisdictions so as to benefit from their significant economies of scale in respect of user devices and network equipment, and to facilitate international roaming.

54. In the Consultation Document the Minister noted the two primary band plans for the 700 MHz band that have emerged internationally; specifically, the FCC band plan and the APT (Asia-Pacific Telecommunity) band plan. The Minister proposed that it would be in the best interest of Bermuda to align itself with the FCC band plan, specifically when it comes to economies of scale and roaming support.

55. Due to the relatively early deployment of LTE 700 MHz networks in the US there are a large number of devices already available for use on the FCC band plan. Adopting the FCC band plan means that there is immediate source of devices to be utilised.

56. The Minister notes that in 2009 the Eastern Caribbean Telecommunications Authority ("ECTEL") adopted a 700 MHz band plan that was not harmonized with the FCC's plan. In 2012 the regulatory commission in Turks and Caicos:

> …found that those Caribbean jurisdictions that have adopted the FCC plan have been the first to licence spectrum in the 700 MHz spectrum band. No jurisdiction adopting the ECTEL plan has done the same as of yet. Consequently, it appears that jurisdictions adopting the FCC plan are far more likely to see the deployment of 4G LTE services in the 700 MHz spectrum band compared to those jurisdictions adopting the ECTEL approach.[24]

In 2013 ECTEL ultimately revised their band plan to align it with the FCC's plan.

57. Furthermore, Bermuda's economy is heavily dependent on international business and tourism.[25] A band plan that enables compatibility of devices with countries that provide a significant source of business visitors and tourists will therefore facilitate economic development and promote the purpose described in ECA Section 5(b). In this respect, the United States, which provides the vast majority of international visitors to Bermuda, is the most natural market with which to align the 700 MHz band plan.[26]

58. Aligning Bermuda with the FCC band plan is consistent with the objectives set out in ECA Section 37(c) regarding the facilitation of the introduction and evolution of new technologies and innovative electronic communications services as well as the general objectives of the ECA relating to reliable and affordable access to quality electronic communications services and providing customers with choice, innovation, and affordability. Alignment of Bermuda's band plan with that of a large market also promotes efficiency, consistent with the objective set out in ECA Section 37(b).

[24] See http://www.telecommission.tc/content/root/files/20120705145807-Public-Notice-2012-10b-Second-700-MHz-Policy-Consultation-Document-Deadline-Extension.pdf at page 10.

[25] It is also important for Bermudians to be able to use their phones when they travel off-island.

[26] For example, in 2011 and 2012 73% of visitors to Bermuda came from the US. See: http://www.slideshare.net/andrewwilliamsjr/2012-yearendvisitorstatisticsbermuda at page 11.

59. For the reasons stated above the Minister proposed that the Regulatory Authority implement the band plan described below in Table 2. This band plan is identical to the FCC band plan, which is split into a Lower Band (698-746 MHz) and an Upper Band (746-806 MHz). It provides for a total of 74 MHz of spectrum for commercial use while 34 MHz of spectrum is set aside for Public Safety networks.[27]

Table 2: 700 MHz BBP

	Block	Frequency Range	Bandwidth
Lower Band	A	698-704 (UL) 728-734 (DL)	2 x 6 MHz
	B	704-710 (UL) 734-740 (DL)	2 x 6 MHz
	C	710-716 (UL) 740-746 (DL)	2 x 6 MHz
	D	716-722	6 MHz unpaired
	E	722-728	6 MHz unpaired
Upper Band	C	746-757 (DL) 776-787 (UL)	2 x 11 MHz
	A	757-758 (DL) 787-788 (UL)	2 x 1 MHz
	Public Safety	763-768 MHz (Broadband) 769-775 MHz (Narrowband) 793-798 MHz (Broadband) 799-805 MHz (Narrowband)	2 x 12 MHz
	D	758-763 MHz (xL) 788-793 MHz (xL)	2 x 5 MHz
	B	775-776 (DL) 805-806 (UL)	2 x 1 MHz

[27] FCC (Adopted October 25, 2013), Report and Order and Order of Proposed Modification In the Matter of Promoting Interoperability in the 700 MHz Commercial Spectrum (WT Docket No. 12-69) and Requests for Waiver and Extension of Lower 700 MHz Band Interim Construction Benchmark Deadlines (Docket No. 12-332), p. 4.

60. Respondents were asked if they agreed with the Minister's proposal for the establishment of the 700 MHz BBP.[28] Both BDC and Digicel agreed, subject to the following caveats.

61. BDC agreed with the Minister's proposal insofar as it aligns with the FCC band plan requirements which were recently modified to ensure wireless infrastructure terminal availability across all operators by mandating interoperability. As noted in the Consultation Document, problems associated with interoperability occurred within the Lower Band because devices for use on AT&T's 700 MHz LTE network which uses spectrum in the B and C blocks (Band Class 17) were not compatible with smaller networks that use spectrum in the A Block (Band Class 12). However, following an FCC investigation of the matter the wireless network operators came to a voluntary agreement to ensure that devices are operable across the Lower Band.[29]

62. The Minister notes that the interoperability issues in the Lower 700 MHz Band would remain a problem for Bermuda until the issue was addressed by the FCC, not the Regulatory Authority. This is because the Bermuda marketplace is dependent upon the equipment developed for the US market. Had the Regulatory Authority 'solved' this issue by mandating Lower 700 MHz Band interoperability prior to the FCC resolving the issue it would have done nothing to speed up the availability of handsets or the deployment of equipment for the frequencies in question. This is because, as suggested above, it is highly unlikely that any equipment manufacturer would produce network equipment or handsets for the Bermuda market when they were not already doing so for the US market.[30]

63. BDC noted that the FCC 700 MHz bandplan also reserves 20 MHz in the upper 700MHz block to public safety and guard bands in order to resolve interoperability and adjacent channel interference issues that BDC claims have hindered deployment of some services. BDC maintains that the decision by the FCC may not be applicable in Bermuda and, as a result, although a divergence from the FCC band plan, could result in additional spectrum being made available for broadband mobile network operations in Bermuda.

64. Digicel also noted that it may be possible to reallocate the Public Safety Bands in the 700 MHz Band to commercial services as it is unlikely a dedicated public safety network will be constructed in Bermuda. Lastly, Digicel argued that band D (Downlink) should not be used if band C is assigned, since the downlink of D would then be adjacent to uplink of C and this could cause interference.

65. The Minister recognizes that the construction of a dedicated public safety network for Bermuda is unlikely in in the near term so this spectrum may go unutilized for a period of time.[31] However, because Bermuda generally relies on the equipment developed specifically for the US and North American markets the required equipment must first be developed for use in those markets before we can realistically consider its use in Bermuda. Furthermore, the Minister is not certain that the equipment, when developed, will be suitable for the provision of commercial services. As such, the Minister determines that it is premature to consider the reallocation or assignment of the Public Safety Bands in the 700 MHz Band at this time. The Minister defers to the expertise of the Regulatory Authority to determine if and when to revisit this issue.

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[28] See Consultation Question 8.

[29] See: http://apps.fcc.gov/ecfs/document/view?id=7520942822.

[30] Surely, the scale of the Bermuda market is insufficient to induce such results if, as 'small' US mobile carriers argued, device manufacturers lacked sufficient scale to create affordable devices that operated across the Lower A, B, and C blocks of the 700 MHz Band.

[31] The Minister notes that in the US there has been a long delay in building the dedicated Public Safety network because of the associated construction costs.

66. Similarly, regarding Digicel's interference concern, the Minister is of the opinion that this is a technical issue related to assignment of spectrum, and not specific to the Bermuda FAT or BBP. As such, the Regulatory Authority shall use its expertise to address this concern if and when the need arises.

67. Thus, for the reasons discussed above the Minister determines that the Regulatory Authority shall establish the BBP for the 700 MHz band based on

68. Table 2, above.

3.2.2 850 MHz Band

69. The frequencies in the range from 824 MHz to 849 MHz and 869 MHz to 894 MHz shall be referred to as the 850 MHz band. The ITU Region 2 allocation for this spectrum is to MOBILE, FIXED, and BROADCASTING. In the FCC allocation table, the 850 MHz band is allocated for LAND MOBILE and FIXED.

70. The 850 MHz band is currently in use in Bermuda for the provision of mobile services using the FCC's allocation and band plan. The Minister proposed to allocate the 850 MHz band to LAND MOBILE and FIXED in the Bermuda FAT. The Minister also proposed to formally establish the 850 MHz BBP based on the FCC's bandplan.

71. Respondents were asked if they agreed with the Minister's proposed allocation(s) for the 850 MHz band, and the proposed bandplan.[32]

72. BDC disagreed with the proposal because it claimed the proposal in the Consultation Document did not match the 850 MHz bandplan defined by the FCC and the 3rd Generation Partnership Project ("3GPP").[33] BDC recommended that the BBP be revised to be identical to the FCC band plan because doing otherwise could cause interference problems and make equipment difficult to obtain.

73. Digicel agreed with the proposed allocations but argued that the bandplan was not efficient because it is difficult to utilize Lower A' and B'. Digicel recommended that the bandplan be reorganized to split the 850 MHz Band in two parts where each is a contiguous 2x12.5MHz (paired).

74. The Minister agrees with BDC that the BBP should be identical to the bandplan established by the FCC because doing otherwise could cause interference problems and make equipment difficult to obtain. For these reasons, and to be consistent with the Minister's other policy determinations, the Minister rejects Digicel's proposed 850 MHz bandplan. Thus, the Minister determines that the Regulatory Authority shall establish the 850 MHz BBP consistent with the bandplan established by the FCC, as shown on the table provided below.

[32] See Consultation Questions 9 and 10.

[33] For example, BDC asserted that the "A" Block starts at 824 MHz in the uplink and 869 MHz in the downlink in the FCC and 3GPP plan. The "A" block in the FCC and 3GPP plan starts at 825MHz on the uplink and 870MHz on the downlink. In addition, the spectrum below 824 MHz is not defined in the FCC and 3GPP band plan. Finally, the FCC 850 MHz plan contains duplex spacing of exactly 45MHz.

Table 3: 850 MHz BBP

850 MHz Spectrum Block Assignments (869.0 - 894 MHz) / (824.0–849.0)				
For Commercial Use				
Block	**Designation**	**Pairing**	**Frequency**	**Total (MHz)**
A	Prime	Paired	869.0-880.0 MHz / 824.0-835.0 MHz	11 + 11 = 22 MHz
B	Prime	Paired	880.0-890.0 MHz / 835.0-845.0 MHz	10 + 10 = 20 MHz
A	Prime	Paired	890.0-891.5 MHz / 846.5-849.0 MHz	1.5 + 2.5 = 4 MHz
B	Prime	Paired	891.5-894.0 MHz / 846.5-849.0 MHz	2.5 + 2.5 = 5 MHz
Total				**51 MHz**

75. Although BDC's comments suggested that the proposed allocation of this spectrum to LAND MOBILE and FIXED services is inconsistent with the FCC's allocations this is not the case. Furthermore, BDC's comments spoke to bandplan issues, not the services to which this spectrum is allocated. As such, the Minister determines that this spectrum be allocated to LAND MOBILE and FIXED in the Bermuda FAT.

3.2.3 1900 MHz Band

76. The frequencies in the range from 1850 MHz to 1910 MHz and 1930 MHz to 1990 MHz shall be defined as the 1900 MHz band. The ITU Region 2 allocation is to FIXED and MOBILE. In the FCC allocation table, the 1900 MHz band is allocated for FIXED and MOBILE.

77. The 1900 MHz band is currently in use in Bermuda for the provision of mobile services using the FCC's allocation and band plan, as show below. The Minister proposed to allocate the 1900 MHz band to FIXED and MOBILE in the Bermuda FAT. The Minister also proposed to formally establish the following as the 1900 MHz BBP.

Table 4 - 1900 MHz BBP

1900 MHz Spectrum Block Assignments (1930.2–1990.0 MHz)/(1850.2–1910.0 MHz)				
For Commercial Use				
Block	**Designation**	**Pairing**	**Frequency**	**Total (MHz)**
Lower A	Prime	Paired	1930.0-1945.0 MHz/1850.0-1865.0 MHz	15 + 15 = 30 MHz
Lower D	Prime	Paired	1945.0-1950.0 MHz/1865.0-1870.0 MHz	5 + 5 = 10 MHz
Lower B	Prime	Paired	1950.0-1965.0 MHz/1870.0-1885.0 MHz	15 + 15 = 30 MHz
Lower E	Prime	Paired	1965.0-1970.0 MHz/1885.0-1890.0 MHz	5 + 5 = 10 MHz
Lower F	Prime	Paired	1970.0-1975.0 MHz/1890.0-1895.0 MHz	5 + 5 = 10 MHz
Lower C	Prime	Paired	1975.0-1990.0 MHz/1895.0-1910.0 MHz	15 + 15 = 30 MHz
Total				**120 MHz**

78. Respondents were asked if they agreed with the Minister's proposed allocation(s) for the 1900 MHz band, and the proposed bandplan.[34]

79. Both BDC and Digicel agreed with the Minister's proposed allocation of the 1900 MHz band, and the associated BBP. As such, and seeing no reason to revise his tentative conclusion, the Minister hereby directs the Regulatory Authority to allocate the 1900 MHz band to FIXED and MOBILE in the Bermuda FAT and to establish the 1900 MHz BBP according to Table 4 above.

3.2.4 2100 MHz Band

80. The frequencies in the range from 1710 MHz to 1755 MHz and 2110 MHz to 2155 MHz shall be referred to as the 2100 MHz band. The ITU Region 2 allocation is to MOBILE and FIXED for 1710 MHz to 1755 MHz and to MOBILE, FIXED, SPACE RESEARCH and Mobile-Satellite for 2110 to 2155 MHz. In the FCC allocation table, the 2100 MHz band is allocated for MOBILE and FIXED.

81. Although a BBP for the 2100 MHz band has not formally been adopted some 2100 MHz spectrum has been assigned for use on a provisional basis based on the FCC's allocation and band plan, as shown below. The Minister proposed to allocate the 2100 MHz band to MOBILE and FIXED in the Bermuda FAT. The Minister also proposed to formally establish the following as the 2100 MHz BBP.

Table 5 - 2100 MHz (AWS-1) BBP

2100 MHz (AWS-1) Spectrum Block Assignments (2110–2155 MHz)/(1710–1755 MHz)				
For Commercial Use				
Block	**Designation**	**Pairing**	**Frequency**	**Total (MHz)**
Lower A	Prime	Paired	2110-2120 MHz/1710-1720 MHz	10 + 10 = 20 MHz
Lower B	Prime	Paired	2120-2130 MHz/1720-1730 MHz	10 + 10 = 20 MHz
Lower C	Prime	Paired	2130-2135 MHz/1730-1735 MHz	5 + 5 = 10 MHz
Lower D	Prime	Paired	2135-2140 MHz/1735-1740 MHz	5 + 5 = 10 MHz
Lower E	Prime	Paired	2140-2145 MHz/1740-1745 MHz	5 + 5 = 10 MHz
Lower F	Prime	Paired	2145-2155 MHz/1745-1755 MHz	10 + 10 = 20 MHz
Total				**90 MHz**

82. Respondents were asked if they agreed with the Minister's proposed allocation(s) for the 2100 MHz band, and the proposed bandplan.[35]

83. BDC and Digicel agreed with the Minister's proposed allocation of the 2100 MHz band, and the bandplan. As such, and seeing no reason to revise his tentative conclusion, the Minister hereby directs the Regulatory Authority to allocate the 2100 MHz band to MOBILE and FIXED in the Bermuda FAT.

[34] See Consultation Questions 11 and 12.

[35] See Consultation Questions 13 and 14.

84. BDC noted that the FCC recently allocated additional spectrum for mobile use in the 2100 MHz band. Referred to as the AWS-3 band it includes 65 MHz in the bands 1695-1710 MHz, 1755-1780 MHz and 2155-2180 MHz. BDC recommended that this spectrum be included in the HDS Table.

85. BDC also noted that the 2100 MHz band is commonly referred to as the Advanced Wireless Service ("AWS") band in the United States. BDC recommended that the RA and Minister consider utilizing identical terminology.

86. The Minister agrees with BDC's proposed addition of the frequencies identified above to the 2100 MHz band and their inclusion in the HDS Table as BDC's proposal is consistent with the Minister's determination that the Regulatory Authority shall maintain and publish the Bermuda FAT and BBP in a manner consistent with ECA Section 36(2)(a), and shall, to the greatest extent practical, seek to coordinate the allocations contained therein with the allocations established by the FCC. As such, the following frequencies shall be included in the Bermuda FAT, BBP, and the HDS table.

Table 6: 2100 MHz (AWS-3) BBP

2100 MHz (AWS-3) Spectrum Block Assignments (1695-1710) & (2155–2180 MHz)/(1755–1780 MHz)				
For Commercial Use				
Block	**Designation**	**Pairing**	**Frequency**	**Total (MHz)**
A1	Non-Prime	Unpaired	1690-1700 MHz	5 MHz
B1	Non-Prime	Unpaired	1700-1710 MHz	10 MHz
G	Prime	Paired	2155-2160 MHz/1755-1760 MHz	5 + 5 = 10 MHz
H	Prime	Paired	2160-2165 MHz/1760-1765 MHz	5 + 5 = 10 MHz
I	Prime	Paired	2165-2170 MHz/1765-1770 MHz	5 + 5 = 10 MHz
J	Prime	Paired	2170-2180 MHz/1770-1780 MHz	10 + 10 = 20 MHz
Total				**65 MHz**

3.2.5 2500 MHz Band

87. The frequencies in the range from 2496 MHz to 2690 MHz shall be referred to as the 2500 MHz band. The ITU Region 2 allocation is to FIXED, FIXED-SATELLITE, MOBILE, and BROADCASTING SATELLITE, Earth exploration-satellite, Radio astronomy, and Space research. In the FCC allocation table, the 2500 MHz band is allocated for FIXED, MOBILE, MOBILE-SATELLITE, RADIODETERMINATION-SATELLITE, Earth exploration-satellite, Radio astronomy, and Space research.

88. This spectrum was assigned in Bermuda but never used to provide a service.

89. The Minister proposed to allocate the 2500 MHz band to MOBILE and FIXED in the Bermuda FAT. The FCC's band plan for this spectrum is show below. The Minister proposed to formally establish the following as the 2500 MHz BBP.

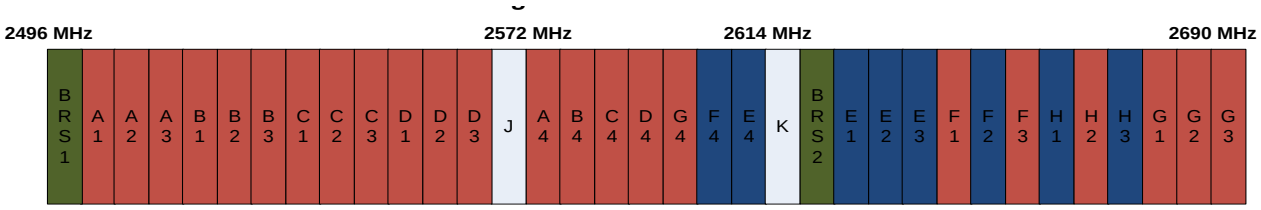

Table 7 - 2500 MHz BBP

	2500 MHz Spectrum Block Assignments (2496–2690 MHz)				
	Broadband Radio Service (BRS) & Educational Broadband Service (EBS)				
	Block	**Designation**	**Pairing**	**Frequency**	**Total (MHz)**
Lower Band Segment (LBS)	BRS1	N/A	N/A	2496.0-2502.0 MHz	6.0
	A1	N/A	N/A	2502.0-2507.5 MHz	5.5
	A2	N/A	N/A	2507.5-2513.0 MHz	5.5
	A3	N/A	N/A	2513.0-2518.5 MHz	5.5
	B1	N/A	N/A	2518.5-2524.0 MHz	5.5
	B2	N/A	N/A	2524.0-2529.5 MHz	5.5
	B3	N/A	N/A	2529.5-2535.0 MHz	5.5
	C1	N/A	N/A	2535.0-2540.5 MHz	5.5
	C2	N/A	N/A	2540.5-2546.0 MHz	5.5
	C3	N/A	N/A	2546.0-2551.5 MHz	5.5
	D1	N/A	N/A	2551.5-2557.0 MHz	5.5
	D2	N/A	N/A	2557.0-2562.5 MHz	5.5
	D3	N/A	N/A	2562.5-2568.0 MHz	5.5
	J	N/A	N/A	2568.0-2572.0 MHz	4.0
Mid Band Segment (MBS)	A4	N/A	N/A	2572.0-2578.0 MHz	6.0
	B4	N/A	N/A	2578.0-2584.0 MHz	6.0
	C4	N/A	N/A	2584.0-2590.0 MHz	6.0
	D4	N/A	N/A	2590.0-2596.0 MHz	6.0
	G4	N/A	N/A	2596.0-2602.0 MHz	6.0
	F4	N/A	N/A	2602.0-2608.0 MHz	6.0
	E4	N/A	N/A	2608.0-2614.0 MHz	6.0
	K	N/A	N/A	2618.0-2624.0 MHz	4.0
Upper Band Segment (UBS)	BRS2	N/A	N/A	2624.0-2629.5 MHz	6.0
	E1	N/A	N/A	2629.5-2629.5 MHz	5.5
	E2	N/A	N/A	2629.5-2635.0 MHz	5.5
	E3	N/A	N/A	2635.0-2640.5 MHz	5.5
	F1	N/A	N/A	2640.5-2646.0 MHz	5.5
	F2	N/A	N/A	2646.0-2651.5 MHz	5.5
	F3	N/A	N/A	2651.5-2657.0 MHz	5.5
	H1	N/A	N/A	2657.0-2662.5 MHz	5.5
	H2	N/A	N/A	2662.5-2668.0 MHz	5.5
	H3	N/A	N/A	2668.0-2673.5 MHz	5.5
	G1	N/A	N/A	2673.5-2679.0 MHz	5.5
	G2	N/A	N/A	2679.0-2684.5 MHz	5.5
	G3	N/A	N/A	2684.5-2690.0 MHz	5.5
	Total				**194.0 MHz**

90. Respondents were asked if they agreed with the Minister's proposed allocation(s) for the 2500 MHz band, and the proposed bandplan.[36]

91. Digicel agreed with the proposed allocations and bandplan but BDC did not agree with the bandplan. BDC recommended that the BBP for this spectrum should match the 3GPP LTE Band 7 with a total bandwidth as follows:

    (a) 2500MHz to 2570MHz (Uplink) and

    (b) 2620MHz to 2690MHz (Downlink)

92. Further, BDC asserted that the spectrum segmentation should maintain at least a 10 MHz bandwidth (paired 2x10) and that there are seven 2x10MHz channels in 3GPP LTE Band 7. BDC claims that its proposed bandplan will allow for LTE growth as the cell grid can be reduced and more equipment vendors build equipment for spectrum near 2600 MHz.

93. Neither respondent recommended different allocations for this spectrum. As such, and seeing no reason to revise his tentative conclusion, the Minister hereby directs the Regulatory Authority to allocate the 2500 MHz band to MOBILE and FIXED in the Bermuda FAT. Regarding the BBP, the Minister notes that BDC's argument here contradicts its general recommendation that Bermuda follow the FCC allocations and assignments because the mobile industry in Bermuda relies on the equipment developed for the US. Thus, to be consistent with the determinations elsewhere in this document the Minister rejects BDC's proposal and determines that the Regulatory Authority shall establish the 2500 MHz BBP that is consistent with the bandplan adopted by the FCC. The Minister defers to the expertise of the Regulatory Authority to determine if and when a different bandplan should be considered for Bermuda.

3.2.6 3500 MHz Band

94. The frequencies in the range from 3300 MHz to 3700 MHz shall be referred to as the 3500 MHz band. The ITU Region 2 allocation is to RADIOLOCATION, Amateur, Fixed, and Mobile for 3300 MHz to 3400 MHz, to FIXED, FIXED-SATELLITE, Amateur, Mobile, and Radiolocation for 3400 MHz to 3600 MHz, and to FIXED, FIXED-SATELLITE, MOBILE, and Radiolocation for 3600 MHz to 3700 MHz. In the FCC allocation table, the 3500 MHz band is allocated to RADIOLOCATION, Amateur, and Radiolocation for 3300 MHz to 3500 MHz; to Radiolocation and Private Land Mobile for 3500 MHz to 3600 MHz; to FIXED-SATELLITE and Radiolocation for 3600 MHz to 3650 MHz; to FIXED, FIXED-SATELLITE, and MOBILE for 3650 MHz to 3700 MHz.

95. The FCC has not yet defined a band plan for the 3500 MHz band. However, the FCC recently issued a Notice of Proposed Rulemaking ("NPRM") in which it proposed to create a new Citizens Broadband Service in the 3550 MHz to 3650 MHz band currently utilized for military and satellite operations. The FCC's stated intent is to promote two advances that would enable more efficient use of radio spectrum; namely, small cells and spectrum sharing.[37]

96. Three licensees in Bermuda currently hold assignments in this band which they use for WiMAX networks:

    (a) BDC has been assigned 3300-3400 MHZ;

    (b) Logic has been assigned 3400-3600 MHz; and

    (c) ECL has been assigned 3625-3700 MHz

[36] See Consultation Questions 15 and 16.

[37] See http://www.fcc.gov/document/enabling-innovative-small-cell-use-35-ghz-band-nprm-order

97. The Minister proposed to allocate the 3500 MHz band as follows:

    (a) 3300 MHz to 3500 MHz to FIXED, RADIOLOCATION, Amateur, and Radiolocation;

    (b) 3500 MHz to 3600 MHz to FIXED, Radiolocation, and Private Land Mobile;

    (c) 3600 MHz to 3650 MHz to FIXED, FIXED-SATELLITE and Radiolocation; and

    (d) 3650 MHz to 3700 MHz to FIXED, FIXED-SATELLITE, and MOBILE.

98. Given the lack of an established FCC band plan the Minister proposed to address the band plan for these frequencies at a later date or as the need arises.

99. Respondents were asked if they agreed with the Minister's proposed allocation(s) for the 3500 MHz band and his proposal not to establish a BBP for the 3500 MHz band at this time.[38]

100. Digicel agreed with both proposals. BDC agreed, and asserted that the allocation and BBP for this spectrum should be deferred until the FCC has established a band plan and the need for these frequencies in Bermuda arise. BDC also noted that it is currently operating in the 3300 MHz band and requested that any allocation or BBP accommodate BDC's operations.

101. Given that the 3500 MHz band is currently under review by the FCC there is no clear path to be followed in Bermuda. Furthermore, the current FCC allocations are not necessarily consistent with the manner in which this spectrum is currently used in Bermuda; namely, WiMAX. As such the Minister hereby directs the Regulatory Authority to allocate the 3500 MHz band in the Bermuda FAT as follows:

    (a) 3300 MHz to 3500 MHz to FIXED, RADIOLOCATION, Amateur, and Radiolocation;

    (b) 3500 MHz to 3600 MHz to FIXED, Radiolocation, and Private Land Mobile;

    (c) 3600 MHz to 3650 MHz to FIXED, FIXED-SATELLITE and Radiolocation; and

    (d) 3650 MHz to 3700 MHz to FIXED, FIXED-SATELLITE, and MOBILE.

102. The Minister finds these allocations reasonable given the need to accommodate the manner in which this spectrum is currently used in Bermuda and the current FCC allocations. Given the lack of an established FCC band plan the Minister defers to the expertise of the Regulatory Authority to determine if and when to establish the BBP for these frequencies.

3.3 Spectrum Assignment

103. Spectrum assignment concerns the means by which the management rights to blocks of spectrum are assigned to individual firms and/or individuals. Spectrum is a scarce resource because there is a only fixed amount available and once the management rights for a block of spectrum is assigned to a given party it is no longer available to other parties.[39]

[38] See Consultation Questions 17 and 18.

[39] Unless a form of spectrum sharing is adopted.

104. Like many jurisdictions, the DoT had historically utilized a first-come-first-served ("FCFS") approach to spectrum regulation whereby administrative decisions made by the DoT, as opposed to market mechanisms such as auctions, are relied upon to determine spectrum allocations and usage. For example, the DoT generally allocated spectrum on a FCFS basis to parties who have submitted requests to the Minister which have included:

    (a) A demonstrated need for the spectrum requested;

    (b) A band and band plan (bandwidth requirement) of the requested spectrum;

    (c) The technology to be used;

    (d) A demonstration of efficient use of spectrum; and

    (e) The timely deployment and use of spectrum.

105. The spectrum assignments issued and documented by the DoT are stored in a centralized database. This database includes the spectrum assigned on a commercial basis to Telecommunications, and Broadcasting licensees, and the frequencies assigned to the Government, individuals and/or organizations for private use.

106. The Minister proposed to maintain the FCFS approach to spectrum assignment for non-HDS frequencies going forward. The Minister opined that this methodology provides sufficient regulatory oversight for non-HDS frequencies.

107. Respondents were asked if they agreed with the Minister's proposal to maintain the FCFS approach to spectrum assignment for non-HDS spectrum going forward.

108. BDC agreed in principle with the Minister that a FCFS approach to assigning non-HDS spectrum should continue to be used because, by its very nature, non-HDS spectrum demand will be low and, therefore, is unlikely to present a situation where competing applications are filed. However, BDC noted that it took this position on the assumption, and its recommendation, that the 600 MHz and SMR bands are excluded from being considered as non-HDS.

109. Digicel also agreed, subject to the qualification that the Regulatory Authority keep track of the proposals made by the main regional groupings of ITU Members in terms of future use of spectrum to facilitate refarming for mobile uses.

110. The Minister agrees that the Regulatory Authority should continue to assign non-HDS frequencies on a FCFS basis for the reasons provided above. However, the Minister determines that when an application is received for such spectrum the Regulatory Authority shall be required to consider the likely near term uses for the requested spectrum and the Regulatory Authority shall be permitted to decline assignment on a FCFS basis if the Regulatory Authority has sufficient reason to conclude the requested spectrum is likely to be added to HDS Table in near term and/or that the public interest is best served by an assignment methodology that is consistent with those described in ECA Section 36(2)(e).[40]

[40] ECA Section 36(2)(e) gives the Regulatory Authority the power to "conduct comparative selection processes, auctions, lotteries or hybrid processes for the award of spectrum licences in cases where demand for the right to use a specific portion of the radio spectrum is expected to exceed supply"

3.3.1 General Policy

3.3.1.1 HDS Assignment Policy

111. ECA Section 36(2)(b) gives the Regulatory Authority the power to specify the criteria and procedures for the assignment of radio frequencies. ECA Section 36(2)(e) gives the Regulatory Authority the power to "conduct comparative selection processes, auctions, lotteries or hybrid processes for the award of spectrum licences in cases where demand for the right to use a specific portion of the radio spectrum is expected to exceed supply".

112. The Minister proposed the use of a comparative selection process where demand for the right to use a specific portion of the radio spectrum is expected to exceed supply.

113. Under a comparative selection process (also referred to as a "beauty contest" or "administrative assignment") the Regulatory Authority would issue a Request for Applications. It would then evaluate applications for spectrum against a list of criteria. Clear advance notice of the criteria to be used and the weightings to be applied to each criterion would be provided to improve the transparency and objectiveness of the process.

114. As highlighted by the Ministry of Energy, Telecommunications and E-Commerce (METEC) in its 2009 Spectrum Consultation,[41] comparative selection processes can impose significant costs on the administering body (in this case the Regulatory Authority) if a large number of applications are received. Delays in assignment may also result. Therefore, the Minister proposed that to ensure that applications are restricted to genuine applicants the Regulatory Authority should be permitted to assess non-trivial and non-refundable application fee, for example, in the range of $10,000 to $20,000 per applicant.

115. Respondents were asked if they agreed that the Regulatory Authority should be permitted to assess a non-trivial and non-refundable application fee, for example, in the range of $10,000 to $20,000 per applicant for HDS frequencies.

116. BDC and Digicel agreed that permitting the Regulatory Authority to levy non-trivial and non-refundable application fees would help to prevent frivolous applications and offset some of the costs associated with a comparative process. As such, and seeing no reason to revise his tentative conclusion, the Minister determines that the Regulatory Authority may assess non-trivial and non-refundable application fees per applicant for HDS frequencies. The level of those fees should be consistent with the goals of preventing frivolous applications and offsetting the costs associated with the comparative process, but not so high as to discourage legitimate applications.

117. BDC also urged the Minister and Regulatory Authority to consider whether application fees could be off-set against the first year of spectrum fees that will be levied on the winning applicant. The Minister rejects BDC's off-set proposal as it disproportionately rewards the 'winning' applicant and punishes the 'losing' applicants.

118. The Consultation Document noted that the benefits of the comparative selection process include the ability of the Regulatory Authority to assign spectrum in a manner that pursues the Spectrum Management Objectives and the general purpose of the ECA. This is particularly the case in respect of the preservation and promotion of effective and sustainable competition (i.e., the objective set out in Section 37(e) of the ECA).

119. Spectrum is an essential input into the supply of many communications services. Spectrum assignments therefore have a fundamental impact on competition in downstream markets, and in particular, for mobile services. Moreover the longevity of spectrum rights means that assignment will affect the market structure over the long-term.

[41] METEC (1 June, 2009) *Spectrum Consultation Document.*

120. The amount of spectrum assigned to a network is a determinant of its capacity to provide service at the time of spectrum assignment and of its ability to increase capacity in future years. This impacts on both the number of customers it can serve, and the quality of service it can provide. For example, a network with a larger amount of spectrum has the potential to provide higher data speeds than a network with less spectrum. The ability to provide bandwidth is becoming increasingly crucial in the context of the explosion of data demand and increasing importance of data services relative to traditional voice.

121. In addition, the relative spectrum holdings of a network as compared with other networks affect its relative cost of production and its cost structure. For example, while cell-splitting may allow for re-use of spectrum so that a network with a relatively small amount of spectrum can still serve the same number of customers as spectrum-rich network, the relatively spectrum-poor network will have higher variable cost of expansion.[42] This reduces a spectrum-poor network's ability to compete aggressively.

122. The above discussion illustrates the importance is ensuring that wireless networks have sufficient spectrum to compete effectively and that substantial imbalances in spectrum between networks have the potential to distort competition. While assignment mechanisms such as lotteries or auctions leave the assignment of spectrum up to chance or allow it to be largely determined by willingness and ability to pay, the comparative selection process enables the Regulatory Authority to assign spectrum to parties that can demonstrate a genuine need for additional spectrum and in a manner the Regulatory Authority considers will advance competition and promote technical efficiency.

123. In addition, because the preservation and promoting of competition will generally encourage the introduction of new technologies and innovation and earlier uptake of technologies, it is likely that the objective contained in 37(c) of the ECA will be satisfied by use of a comparative selection process.

3.3.1.1.1 Hybrid Processes

124. The use of an assignment procedure such as comparative selection is not strictly necessary where demand is less than or equal to supply. It is not always obvious whether demand will exceed supply. As a result a hybrid assignment process is an option in which a FCFS assignment is applied if demand does not exceed supply, with a comparative selection process applying if demand does exceed supply.

125. Under this policy the Regulatory Authority would issue a Request for Applications. If each spectrum block was only applied for by one applicant then spectrum blocks may be granted as requested to all applicants. However, if there were multiple applications for any of the spectrum blocks then a comparative selection process would apply. While retaining the benefits of the comparative selection process, costs are reduced in the event that demand does not exceed supply and the FCFS process applies.

126. The Minister proposed that a hybrid FCFS-Comparative Selection assignment process for all HDS frequencies would best satisfy the Spectrum Management Objectives and the purposes of the ECA. Well defined criteria and weightings would increase transparency of the process and encourage objectiveness.

127. Respondents were asked if they agreed that a hybrid FCFS-Comparative Section assignment method for HDS frequencies is most practicable and in line with the Spectrum Management Objectives and general purposes of the ECA.[43]

[42] This assumes that the cost of obtaining additional spectrum is less than the cost of the infrastructure and equipment required to increase the number of cells in a network. According to the Regulatory Authority, comments from representatives of the mobile network operators generally support this assumption.

[43] See Consultation Question 21.

128. BDC agreed that the proposed hybrid FCFS-Comparative Selection process would offer a balance of flexibility and administrative efficiency appropriate for Bermuda. Digicel also agreed with the proposal, provided that Government instituted policies:

    (a) to maximize the amount of available spectrum (and thus reduce or eliminate the need for the HDS Table); and

    (b) requiring a forward looking assessment of likely spectrum use to determine if a FCFS approach should be adopted or whether contingencies need to be included in the licence allocations to allow for re-farming.

129. Digicel did not offer an alternative proposal to consider or explain its position if one or both of these qualifications were not met. Nor did Digicel explain how, when, or why some (or all) future spectrum licenses should include contingencies to allow for re-farming.

130. Above at paragraph 28, the Minister agreed that the Regulatory Authority's approach should be forward looking and take into account what the other regulatory agencies, such as the ITU and FCC, are considering regarding spectrum allocations. However beyond affirming this position the Minister finds that Digicel's proposed conditions are poorly supported and speculative. As such, and seeing no reason to revise his tentative conclusion, the Minister determines that the Regulatory Authority shall employ a hybrid FCFS-Comparative Section assignment method for the assignment of HDS frequencies.

3.3.1.2 Principles for assigning spectrum through a Comparative Selection process

131. In the Consultation Document, the Minister identified some general criteria that could potentially be used in the comparative spectrum assignment process.

132. Potential general criteria for spectrum assignment process:

    (a) Local presence in Bermuda – Applicants must either have, or make a durable commitment to maintain, a presence in Bermuda.

    (b) Eligibility to hold a licence under Bermuda law.

    (c) Promotion of Spectrum Management Objectives – The applicant proposes to provide electronic communications services of a quality/coverage and price that would promote the Spectrum Management Objectives. Matters to be considered could include existing spectrum assignments (in particular, sub 1-GHz assignments), access to new technologies, enhanced services, reduction in prices, increased competition in markets.

    (d) Financial position – The applicant must demonstrate that it has the necessary financial resources to provide the retail services and meet all roll-out and other commitments contained in the Licence.

    (e) Technical Capability – The applicant must put forward a sound technical plan for coverage and service provision using the spectrum, and demonstrate that it has the technical resources and expertise to implement it.

    (f) Spectral Efficiency – The applicant would be required to justify the quantity of spectrum for which it is applying.

    (g) Other Benefits – The applicant will generally enhance Bermudian society consistent with the ECA general purposes (e.g., promotion of Bermudian ownership and Bermudian employment at all levels of the electronic communications sector; enhancing Bermuda's competitiveness in the area of electronic communications so that Bermuda is well-positioned to compete in the international business and global tourism markets; etc.).

133. Respondents were asked if they agreed with the relevance of the proposed criteria; what criteria should be added or removed; and what weighting should be attached to the criteria.[44]

134. BDC generally agreed with the criteria and suggested that Minister consider whether applicants should also state the benefits to consumers of its proposed spectrum assignment.

135. Digicel argued that local presence and ability to hold a licence under Bermuda law should be a single item that is excluded from the weightings because it is a minimum requirement for all applicants. Digicel also asserts the criteria should include the ability of a communications provider to attract international investment to Bermuda and to maximize innovation in service provision.

136. BDC claimed that regulators and government authorities in other jurisdictions have equally weighted the relevant criteria identified in a comparative process. BDC argued that while this is an appropriate starting point; the Regulatory Authority should retain the authority to specify different weighting in its call for applications for particular spectrum depending on the circumstances associated with that allocation and assignment.

137. Digicel proposed the following weightings:

Criteria	**Weight %**
Promotion of Spectrum Management Objectives	15
Financial position	30
Technical Capability	30
Spectral Efficiency	10
Innovation	10
Other Benefits	5
Total	100

138. The Minister believes that BDC's suggestion to add consumer benefits as a criteria is not necessary as this is already accounted for in the "Promotion of Spectrum Management Objectives" as described in paragraph 133(c). The Minister agrees with Digicel that having, or making a credible commitment to maintain, a local presence and eligibility to hold a licence under Bermuda law is a minimum requirement for all applicants, and as such, should be listed as a single item that is excluded from the weightings. However, the Minister rejects Digicel's suggestion that the criteria should include the ability of a communications provider to attract international investment to Bermuda as it is inconsistent with the general goal of the ECA to promote Bermudian ownership and Bermudian employment at all levels of the electronic communications sector. Similarly, the Minister does not believe that maximizing innovation in service provision, in and of itself, is sufficiently beneficial so as to be considered its own criteria. As for the relative weightings of the criteria, the Minister agrees with BDC that the Regulatory Authority should retain the authority to specify different weighting in its call for applications for particular spectrum depending on the circumstances associated with that allocation and assignment.[45]

[44] See Consultation Questions 22 and 23.

[45] The Minister notes that these issues will be finalized in the upcoming HDS Application Process Consultation.

3.3.1.3 Spectrum Caps

139. Given the need for spectrum in order to enter into and expand in the provision of wireless services, spectrum caps can be used to prevent spectrum hoarding. Spectrum hoarding has the effect of blocking rivals from obtaining access to the amount of spectrum they need to compete effectively. Spectrum caps can be applied to the total holdings of all frequencies or to individual bands or groups of bands.

140. The FCC in a recent review of competition in the mobile markets explains why the propagation characteristics of low and high frequency bands imply that carriers ideally require a mix of low and high spectrum:

> *"spectrum resources in different frequency bands have distinguishing features that can make some frequency bands more valuable or better suited for particular purposes. From a competitive perspective, given these complementary characteristics, a provider is best positioned if it holds both low and higher frequency spectrum. Holding a mix of frequency ranges may be optimal from the perspective of providing the greatest service quality at low cost. For instance, given the superior propagation characteristics of spectrum under 1 GHz, particularly for providing coverage in rural areas and inside buildings, providers whose spectrum assets include spectrum below 1 GHz may possess certain competitive advantages for providing robust coverage when compared to licensees whose portfolio is exclusively comprised of higher frequency spectrum. On the other hand, providers with higher frequency spectrum may possess advantages in addressing capacity needs."*[46]

141. This implies that it may be reasonable to implement separate caps for HDS assignments in low and high frequency bands (i.e., above and below 1GHz), as well as an overall cap on HDS holdings.

142. The FCC's current approach to spectrum caps is to examine the competitive effects of spectrum acquisition where a firm will hold approximately one third or more of the total available mobile spectrum. However, in light of the different propagation characteristics of sub-1GHz spectrum and the greater scarcity of that spectrum the FCC is currently consulting on whether a separate spectrum threshold limit should be applied to those lower frequency bands.[47] The US Department of Justice ("DOJ") in its submission to the FCC, expressed the view that "it is important that the Commission devise policies that address the allocation of low-frequency spectrum in particular so that acquisitions of such spectrum do not hamper the ability of carriers to compete in markets where that spectrum is important."[48]

143. The Minister proposed to implement a general spectrum cap of no more than 50% of any HDS band. The amount of spectrum in each HDS band would be based on the HDS Band Size provided on Table 1, as amended by this Policy Statement.[49] The Minister did not believe that a separate low and high frequency caps are called for at this time. The Minister opined that the proposed cap is sufficient to permit at least 2 licensees to operate networks in each band, and that the proposed cap is consistent with the Spectrum Management Objectives.

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[46] FCC (19 March 2013) *Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services – Sixteenth Report*, para 135.

[47] FCC (28 September, 2012), *Notice of Proposed Rulemaking In the Matter of Policies Regarding Mobile Spectrum Holdings*, WT Docket No. 12-269, para 35.

[48] *Ex Parte* Submission of the United States Department of Justice, *In the Matter of Policies Regarding Mobile Spectrum Holdings Before the Federal Communications Commission* WT Docket No. 12-269, p. 14.

[49] The final table appears in Appendix A – HIGH DEMAND SPECTRUM TABLE.

144. Respondents were asked if they agree that no carrier can be assigned more than 50% of any HDS band.[50]

145. BDC disagreed with the proposal that no carrier can be assigned more than 50% of any HDS band. According to BDC, spectrum caps (which are hard limits on the amount of spectrum any one entity may hold) do not correlate with competition and have been abandoned in many markets (including the US) in favor of a more flexible approach. According to BDC, any aggregation limit imposed by the Minister should be a flexible part of a competitive analysis that considers all spectrum held by a carrier (without focusing on a single band) which is applied in a forward looking manner and not used retroactively to reclaim spectrum.

146. Digicel did not recommend that the 50% assignment maximum be imposed as a hard rule. According to Digicel, spectrum caps are best avoided and, if imposed, must consider the needs of the operator as well as the usefulness of the spectrum assignments that are consistent with the cap.

147. Whilst Link agreed with the proposed use of spectrum caps to prevent "hoarding," it asserted that set-asides may be a more targeted tool for enabling new entrants to the wireless market.

148. BDC suggested that if a spectrum cap is imposed it should be flexible, and forward looking. However, in using the FCC's approach as support for its proposal BDC ignores the fact that the FCC was careful not to assign more than 50% of a given band to a single firm in the first place. When the FCC assigned the most valuable commercial spectrum it generally limited the size of assignments so that no fewer than 2, and often at least 3, firms received spectrum in a given band. This, combined with the application of strict merger and competition guidelines which prevented excessive spectrum concentration by a single licensee, has allowed the FCC to evolve to a more flexible approach from its initial position.[51] The Minister understands that the same cannot be said of the situation in Bermuda where merger activity resulted in spectrum concentration whereby a single firm has been assigned the only available sub-1 GHz CMRS spectrum.

149. Therefore, the Minister is of the opinion that a spectrum cap is necessary to facilitate competition. The Minister also believes that the spectrum cap should be transparent, administratively efficient, and reflect the realities of the local market. As such, the Minister determines that the Regulatory Authority shall impose a cap on all HDS assignments such that no firm, or affiliates (as defined in the ECA or RAA), be permitted to hold more than 50% of any HDS band, subject to the exceptions described below. This cap shall be applied, on a forward looking basis from the effective date of this Statement any time there is an application for a new spectrum assignment, a renewal of an existing spectrum assignment, and/or when a merger or other consolidation is proposed amongst spectrum licensees.

150. The Minister rejects Link's proposal to require the Regulatory Authority to adopt set asides for new entrants and notes that there is a trade-off in adopting set-asides for entrants and holding valuable spectrum out of the market. However, while not adopting Link's proposed policy the Minister shall not prohibit the Regulatory Authority from implementing a set-aside mechanism if the Regulatory Authority determines that it is both necessary and in the public interest to do so in a given circumstance.

[50] Consultation Question 24.

[51] Furthermore, the Minister notes that the FCC and US Department of Justice policies must be flexible enough to be applied to 300 plus markets in US without causing unwanted distortion. In Bermuda there is currently a single nationwide market to consider so the high level of flexibility required in the US is not needed.

151. In the Consultation the Minister proposed that the spectrum cap be based on the total amount of spectrum in each HDS band. However, not all of the spectrum in each band is available for commercial use because some blocks in the band plan are reserved for 'Public Safety' networks and other blocks, even though assigned to commercial use, have no equipment available for use in those frequencies.[52] For example, in the 700 MHz band, the actual amount of usable commercial spectrum at this time is only 58 MHz, not 108 MHz.

152. Given this large difference, the Minister concluded that for the purposes of assessing compliance with a spectrum cap, the Regulatory Authority shall calculate the total amount of spectrum in each HDS band based on commercially usable spectrum, that is, spectrum for which equipment is commercially available.[53]

153. Respondents were asked if they agreed with the Minister's proposal to calculate the total amount of spectrum in each HDS band based on commercially usable spectrum.

154. Both BDC and Digicel agreed that if a cap or screen is implemented, it should only include the spectrum that can be commercially deployed. BDC noted that the FCC, in the application of its spectrum aggregation limits, considers whether spectrum is "suitable and available" and periodically reviews whether technology has changed the applicability of this metric to specific blocks of spectrum.

155. The respondents generally supported the Minister's proposal. As such, and seeing no reason to revise his tentative conclusion, the Minister determines that the Regulatory Authority shall calculate the total amount of spectrum in each HDS band based on commercially usable spectrum, and that the Regulatory Authority shall update its calculation of commercially usable spectrum based on the market conditions in Bermuda and other jurisdictions, such as the US and North America, that have important strong geographical and wireless synergies with Bermuda.[54]

156. Given the breakdown of the FCC band plan and the fact that the upper and lower bands have reversed duplexing it is not currently feasible to assign the available 58 MHz in the 700 MHz band evenly between 2 parties. To be sure, the Minister has not proposed or condoned such an outcome. However, the example illustrates that the peculiarities of a band plan may conflict with the proposed spectrum cap and/or prevent efficient spectrum assignments in a given band.[55] Therefore, the Minister proposed that the Regulatory Authority be permitted to waive strict compliance with the proposed spectrum cap only to accommodate the differences in block sizes within the BBP.

157. Respondents were asked if they agreed with the Minister's proposal to allow the Regulatory Authority to waive strict compliance with the proposed spectrum cap only to accommodate the differences in block sizes within a band plan.

[52] The Public safety blocks also suffer from this problem as the Public Safety network has not been established in the US so no equipment exists at this time. Early estimates suggest that it will cost $7 Billion dollars to build the nationwide public safety network in the US.

[53] For example, in the 700 MHz band currently only the 58MHz of the Lower A, B, and C, and Upper C blocks would be included in the calculation of the total spectrum available.

[54] The inclusion of market conditions in "other jurisdictions, such as the US and North America, that have important strong geographical and wireless synergies with Bermuda" reflects the fact that Bermuda currently relies on equipment manufactured for these other jurisdictions.

[55] For example, in the 700 MHz band equipment that was first made available for the 24 MHz in the Lower B and C blocks, and the 22 MHz of the Upper C block, strict application of the proposed spectrum cap would prevent a single licensee from being assigned the Lower B and C blocks.

158. BDC asserted that Regulatory Authority should be able to waive any rules, but within strict guidelines and as long as it is for the public's interest. The Minister agrees with the qualification proposed by BDC as it relates to spectrum cap. As such, the Minister determines that the Regulatory Authority shall be permitted to waive strict compliance with the proposed spectrum cap to accommodate the differences in block sizes within a band plan provided it can show that the waiver is both necessary and in the public's interest.

3.4 Spectrum Fees

159. The Minister proposed to introduce administered[56] incentive pricing (AIP) with the goal of incentivising efficient use of spectrum for all HDS bands. The Minister opined that the AIP methodology is consistent with the efficiency objective described in ECA Section 37(b), the pricing guidelines of ECA Section 40, and provided the best means for incentivising efficient use of spectrum in Bermuda. As such, the Minister tentatively concluded that spectrum assignment fees for HDS assignments should be based on the AIP methodology.

160. Respondents were asked if they agreed that the AIP methodology are consistent with the requirements of the ECA and provide the best means of incentivising efficient use of spectrum.

161. According to Digicel, AIP pricing should be avoided if at all possible because it seeks to recover opportunity costs instead of just the administrative cost of regulating spectrum.

162. The Minister rejects Digicel's argument. ECA Section 40(1)(c) specifically requires spectrum fees to reflect opportunity costs of a particular frequency or frequency band. Further, the Minister believes that AIP pricing offers the best means for incentivising efficient use of spectrum in Bermuda.

3.4.1 Fee Levels

163. Implementing AIP requires the Minister to first set the price of the reference band. The price for units of spectrum in other HDS bands would be set as a percentage of the price of the reference band.

164. The Minister proposed to use the 850 MHz band as the AIP reference band, and that the annual fee for each 2 x 1 MHz of assigned spectrum in the reference band be set at $37,000. The Minister tentatively concluded that this level of fees is reasonable, and sufficient to encourage spectral efficiency.

165. Given the costs and difficulty in conducting a Bermuda-specific spectrum opportunity cost study the Minister tentatively concluded that it is appropriate to rely on the values derived from the UK AIP Study[57] (with minor modifications) to establish fees for HDS band assignments. The weightings and annual prices for each of the HDS bands are provided below in Table 8.

[56] Administered pricing is where the Minister makes and administrative decision when setting prices.

[57] See Final Report: Defence Demand for Spectrum: 2008 – 2027, Prepared by PA Consulting Group for the Ministry of Defence, EVH-08-0047-R_D, 24 November 2008, at page i. Available at: http://www.mod.uk/NR/rdonlyres/733C18ED-A59B-4282-BA66 98693FF0D29E/0/spectrum2008_2027.pdf

Table 8: Proposed AIP Ratios and Annual Fees

Bermuda HDS Band	Comparable UK Band	Percent of 900 MHz value	Annual Fee per 2 x 1 MHz
700 MHz	900 MHz	100.00%	$37,000
850 MHz	900 MHz	100.00%	$37,000
1900 MHz	1800 MHz	78%	$28,860
2100 MHz	2000 MHz	39%	$14,430
2500 MHz	2300 MHz	33%	$12,210
3500 MHz	4500 MHz	3%	$1,110

166. Link expressed concern that the proposed application and annual fees for HDS frequencies may be too high for a market the size of Bermuda. Link notes that if the fees are set too high they could, in combination with substantial startup and early stage operating costs, undermine the business case for entering the wireless market. Link maintains that a new entrant would be undertaking a "greenfield" project starting from scratch and trying to win customers from the incumbent providers that are able to afford additional spectrum fees because of their existing customer base. Link claims that in this rather perverse way, excessive spectrum fees actually work to the benefit of the incumbent providers.

167. Link encourages Government to adopt new entrant concessions or accommodations that will encourage and enable competition in the wireless market. For example, for new entrants, Link recommended that:

    (a) spectrum fees might be deferred for some reasonable period of time until a network is actually deployed or services launched;

    (b) spectrum fees could be set at a lower initial amount and ramped up over time to take into account the absence of a customer base in the initial launch phase.

    (c) Government could encourage entry to the wireless market through "non-financial" means including the use of spectrum set-asides.

168. BDC and Digicel recommended lower fees and proposed setting the reference rate in the range of $6,500-$10,000. Digicel recommended that the Government be cautious in terms of introducing spectrum fees for the first time given other cost burdens on the industry and the need to encourage investment. Digicel believes that the reference rate should be no greater than US$6,500 per annum.

169. The recommendations from BDC and Digicel were based largely on the fees paid in the Caribbean or other small island jurisdictions on the basis of US dollars per MHz per capita per annum ("MHz-POP"). For example, BDC claimed that the Minister's proposed fee of $37,000 annually for 2x1MHz is tremendously expensive as it translates to a value of $0.28 per MHz-POP while the mean and median values for BDC's 13 observation sample are $0.044 and $0.041, respectively. However, in their analysis both parties sought to ignore Anguilla ($0.24 MHz-POP) as an outlier.

170. BDC also recommended that the fee associated with the 1900 MHz Band be reduced to the level associated with the 2100 MHz Band because BDC claims that propagation characteristics and spectral utilization indicate that the 1900 MHz Band is more akin to the 2100 MHz Band than 850 MHz Band in terms of performance and, therefore, the fee structure of 1900 MHz and 2100 MHz should be similar.

171. Based on the comments received from industry and internal deliberations the Minister determines that the reference rate for Bermuda shall be set at $25,000 per 2 x 1 MHz. However, in order to make the fee calculations more intuitive and administratively simple, the Minister determines that the rates shall be set per 1 MHz of assigned spectrum. Thus, the HDS Reference Rate per 1MHz of assigned spectrum shall be established as $12,500.00. The fees for each HDS Band are shown on the following table.

Table 9: AIP Ratios and Annual Fees

Bermuda HDS Band	Percent of 850 MHz value	Annual Fee per 1 MHz
700 MHz	100.00%	$12,500
850 MHz	100.00%	$12,500
1900 MHz	78%	$9,750
2100 MHz	39%	$4,875
2500 MHz	33%	$1,125
3500 MHz	3%	$375

172. The Minister is of the opinion that this rate is reasonable, and sufficient to raise significant revenue and encourage spectral efficiency, yet will not disproportionately impact the licensees' profitability, or impede investment. This is particularly true for the licensees who are assigned spectrum in the more valuable lower frequency bands, such as BDC and Digicel as their recent financial data suggests that both firms are more than capable of assuming the proposed spectrum fees without raising retail rates while remaining profitable and capable of investing in their networks. Furthermore, observations from other markets indicate that competing firms do not raise retail rates when additional spectrum is gained through auctions or third party purchases.

173. The Minister does not expect the introduction of spectrum fees to subdue investment, especially where new technologies and services are concerned. While BDC and Digicel recommended that the Government be cautious about introducing spectrum fees for the first time, given the need to encourage investment, they already appear to generate ample revenue to fund network investment. Furthermore, the anticipated rollout of new 4G mobile equipment and services will very likely provide additional revenue as customers flock from 2nd and 3rd Generation mobile services to the improved high speed data plans made possible by 4G technology.

174. Above it was noted that BDC estimated that $37,000 annually for 2x1 MHz translates to a value of $0.28 per MHz-POP. This suggests that the $25,000 reference rate (for 2x1 MHz) corresponds to approximately $0.19 per MHz-POP. This is higher than the average of the benchmarks provided by BDC and Digicel but well below the Anguilla. The Minister does not find that the rate is too high for the reasons noted above, and because the per capita GDP and average revenue per user ("ARPU") are much higher in Bermuda than they are in the jurisdictions relied on by BDC and Digicel. Furthermore, the proposed AIP fees represent a small percentage of the revenue generated by BDC and Digicel; far less than what licensees in other jurisdictions licensees pay in spectrum license (or usage fees) and taxes.[58]

[58] For example, India recently lowered its spectrum usage charge to 5% of revenue. It was previously as high as 8%. In 2001, OFTA, the Hong Kong telecommunications authority held an auction to license 3G spectrum (2100 MHz Band). In this highly competitive market four operators bid percentages of turnover they would offer as an

175. The Minister rejects BDC's proposal to lower the fee for the 1900 MHz band so it is closer to the 2100 MHz band fee. BDC's argument is not well supported and the Minister has more confidence in the UK study that generated the values originally proposed by the Minister.

176. Regarding the new entrant concessions the Minister shall permit the Regulatory Authority to defer spectrum fees for up to six months' time or until such time as the network is operating, whichever is shorter. The Minister understands Link's general concerns regarding the cost of entry; but the Minister does not feel that the proposed spectrum fees are so high as to erect a barrier to entry as the proposed fees are a small percentage of the cost of building and maintaining a wireless network.

3.4.2 Fee Structure

177. The Minister considered two potential options for the structure of the assignment fees for HDS bands:

    (a) Collect an upfront fee per assigned 2x1 MHz to cover the full term of the assignment; or

    (b) Levy a regular periodic (monthly, quarterly, or annual) fee per assigned 2x1 MHz;

178. The Minister tentatively concluded that the levy of a periodic fee is preferable because imposing an upfront charge could be disruptive to the market by imposing a significant and unexpected capital requirement on all networks and it could increase barriers to entry for potential new entrants by increasing their capital requirements. Furthermore, a periodic fee was deemed preferable because it permits Government to make adjustments to reflect market conditions going forward and it is more likely to encourage spectral efficiency.[59]

179. As such, the Minister concluded that the fee structure that best satisfies the Spectrum Management Objectives is to adopt a periodic fee per allocated 2x1 MHz of spectrum. The Minister proposed that this fee be assessed on a quarterly basis to be consistent with existing administrative and authorization fees.

180. Respondents were asked if they agreed that the levying of a periodic fee (quarterly, per 2x1 MHz) was preferable to an upfront fee for spectrum, and most consistent with the objectives of the ECA.

181. Both BDC and Digicel agreed that a quarterly fee was preferable to an upfront fee for spectrum. As such, and seeing no reason to revise his tentative conclusion, the Minister determines that spectrum fees shall be assessed on a quarterly basis per 1 MHz assigned.

oOO END OOo

annual fee, with each of the four winners paying the lowest winning fee of 5%. A recent study by A.T. Kearny showed Telecom operators in Europe already contribute significant tax revenue to European governments—on average, 24 percent of the average price per minute (APPM). These contributions include the value-added tax (VAT), social security tax, corporate tax, regulatory fees, and telecom sector-specific taxes. This figure did not include the cost of purchasing spectrum assignments. See: http://www.atkearney.com/documents/10192/1046683/Taxing+Telecom-The+Case+for+Reform.pdf/88c2d30c-f0d4-4496-b7e3-ab9298d09ced

[59] With a one-time upfront fee firms have little or no financial incentive to return unused or underused spectrum or adopt new technologies that are more spectrally efficient.

Appendix A – HIGH DEMAND SPECTRUM TABLE

HIGH DEMAND SPECTRUM TABLE

HDS BAND NAME	FREQUENCY RANGE	HDS BAND SIZE
700 MHz Band	698 to 806 MHz	108 MHz
850 MHz Band	824 to 849 MHz 869 to 894 MHz	50 MHz
1900 MHz Band	1850 to 1910 MHz 1930 to 1990 MHz	120 MHz
2100 MHz Band (AWS-1)	1710 to 1755 MHz 2110 to 2155 MHz	90 MHz
2100 MHz Band (AWS-3)	1690 to 1700 MHz 1700 to 1710 MHz 2155 to 2180 MHz 1755 to 1780 MHz	65 MHz
2500 MHz Band	2496 to 2690 MHz	194 MHz
3500 MHz Band	3300 to 3700 MHz	400 MHz[60]

[60] We note that this was incorrectly shown as 4 GHz in the MEED Consultation. The correct band size is 400 MHz or 0.4 GHz.