



BERMUDA
**REGULATORY
AUTHORITY**

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**ECA Section 78
Transitional Spectrum Investigation:
Bermuda Digital Communications
Limited ("BDC")**

**Final Decision
and Order**

Final Decision and Order
Matter: SC-1222-2013
Date: 23 December 2014

NON-CONFIDENTIAL VERSION

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A. INTRODUCTION AND BACKGROUND

1 Scope of this Final Decision and Order

1. The Regulatory Authority (the “Authority” or “RA”) hereby issues its Final Decision and Order pursuant to Section 78 of the Electronic Communications Act 2011 (the “ECA”) concluding its investigation of the radio frequency spectrum provisionally licensed to Bermuda Digital Communications Limited (“BDC”) in association with the grant of BDC’s Integrated Communications Operating Licence (“ICOL”) on 29 April 2013. This Final Decision and Order relates to the Authority’s investigation of BDC’s spectrum assignments only. It addresses, along with other evidence obtained during the investigation, comments submitted on the comprehensive (non-confidential) Draft Final Decision and Order (the “Draft Decision”)¹ that was published by the Authority on its website on 15 October 2015.
2. The relevant sections of the ECA that give rise to this investigation are set out in the Act’s Transitional Provisions (Part 12). They constitute one of a series of measures that the RA was required to undertake in order to implement the new regulatory framework for electronic communications established by the ECA. Pursuant to ECA Section 73(2)(c)(i), the spectrum licences awarded to ICOL holders at the time of the initial grant were required to reflect each licence holder’s spectrum assignments as at the date of commencement of the ECA. This same provision of the ECA specifies that each transitional spectrum licence should have a duration of 18 months, corresponding to the time period anticipated for the RA’s transitional investigation of spectrum efficiency pursuant to ECA Section 78.
3. In combination, these transitional provisions of the ECA were meant to give the Authority sufficient time to examine the radio frequencies that had been made available to licensees on an essentially *ad hoc* basis under the Telecommunications Act 1986, in order to ensure that the spectrum assigned prior to the commencement of the ECA is not being used inefficiently. The transitional spectrum licences granted by the Authority to each of the relevant ICOL holders pursuant to ECA Section 73(2)(c) mirror the requirements of the ECA in relation to the conduct of this spectrum investigation. For example, Condition 7.4 of the transitional spectrum licences requires the licensee to cooperate fully with the Authority in the ECA Section 78 investigation and to provide a detailed assessment of its spectrum usage in a format prescribed by the Authority no later than six months following grant of the spectrum licence.
4. As discussed in Section A.4 below, the “efficient use of spectrum” – which encompasses both economic and technical efficiency – is one of several objectives of spectrum management enumerated in Part 7 of the ECA (Section 37(1)(b)), which concerns the use of radio spectrum generally. “Efficient use” is a priority for spectrum policy makers and regulators not only in Bermuda but around the world for reasons that are highlighted

¹ In order to provide an overview of the preliminary results of its investigation to all interested stakeholders, the Authority published on its website a non-confidential version of the Draft Decision covering the Authority’s investigation of all relevant ICOL holders. In addition to BDC, these include: Digital Broadband Limited (“BDB”), Telecommunications (Bermuda & West Indies) Limited (“Digicel”) and Logic Communications Limited (“Logic”) which are the subject of separate decisions by the Authority following the conclusion of its investigation. The spectrum assigned to World on Wireless Ltd. (“WOW”) in the 700 MHz band is being dealt in a separate proceeding to consider a proposal made by WOW to relinquish this spectrum. See: World on Wireless 700 MHz Spectrum Migration Proposal, Matter: SC-1501/2014, 31 January 2014.

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in the ECA at Section 35(1). That provision recognizes “the importance of radio spectrum as a scarce national resource and a public good of social, cultural and economic value.”

5. Although ECA Section 37 identifies a number of spectrum management objectives, the focus of ECA Section 78 (a transitional provision set out in Part 12 of the ECA) is to ensure that appropriate measures are taken if the Authority concludes that spectrum awarded prior to the ECA’s commencement is not being utilised efficiently. The limited purpose of Section 78 is confirmed by ECA Section 72, which provides that the transitional provisions of Part 12 “apply notwithstanding any contrary provisions” in the ECA or the Regulatory Authority Act 2011 (“RAA”).
6. In order to ensure the efficient use of spectrum that was assigned before the effective date of the ECA, Section 78 empowers the RA to decline to renew, or to modify, a spectrum licence if the RA concludes, following an investigation, that:
 - a) the licensee is “inefficiently utilizing” some or all of the radio frequencies provisionally assigned to it pursuant to ECA Section 73(c);
 - b) the licensee has failed to demonstrate a “reasonable need” for any frequencies that the RA has concluded are being used inefficiently; and
 - c) it is necessary for the licensee to vacate some or all of these frequencies in order to ensure the “efficient use” of spectrum.
7. If the Authority decides to reclaim any spectrum thus identified, the spectrum will become available for re-assignment to ICOL holders providing new or competing services that require its use.
8. The transitional spectrum licences issued by the Authority to BDC in association with its ICOL on 29 April 2013 were valid until 29 October 2014 in accordance with ECA Section 73(2)(c)(i). Upon the expiry of these licences, the Authority issued four new spectrum licences to BDC, each of which became effective on 30 October 2014.² These licences reflect the requirements of the Minister’s Policy Statement dated 22 September 2014,³ as well as the preliminary conclusions set out in the Authority’s Draft Decision. They cover the BDC spectrum assignments that have been the focus of the Authority’s investigation over the past 14 months, and which are the subject of this Final Decision and Order. The four spectrum licences in question include the following:
 - A 10 year Spectrum Licence (expiry on 29 October 2024) for Commercial Mobile Radio Services (003-CMR-01). This Licence, which covers assigned spectrum for which there was no *prima facie* case for reclamation under ECA Section 78, reassigns 2 x 12.5 MHz⁴ of the 850 MHz spectrum in the B Blocks to BDC, and all of BDC’s 1900 MHz spectrum (see Sections B & C below).
 - A 10 year Spectrum Licence (expiry on 29 October 2024) for Fixed Wireless Access Services (003-FWA-01). This Licence, which covers assigned spectrum for which there was no *prima facie* case for reclamation under ECA Section 78, reassigns all of BDC’s 3500 MHz spectrum (see Section B below).

² These Licences may be modified further as necessary to implement this Final Decision and Order.

³ See Section D below.

⁴ Frequencies are normally assigned as paired spectrum for uplink and downlink transmission. The convention used to denote the amount of uplink and downlink spectrum is “2 x [the given amount of uplink/downlink bandwidth]”.

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- A 10 year Spectrum Licence (expiry on 29 October 2024) for Microwave Point-to-Point Services (003-MPP-01). This Licence reassigns to BDC frequencies in a non-High Demand Spectrum band which were not the subject of the current proceeding (see Section A.3 below).
- A Transitional Spectrum Licence (expiry 28 January 2015) for Commercial Mobile Radio Services (003-CMR-01T). This Licence, which covers the assigned spectrum that the Authority preliminarily found to be unused or inefficiently used, and therefore potentially subject to recovery at the conclusion of its investigation, reassigns the 2 x 12.5 MHz of the 850 MHz spectrum in the A Blocks to BDC (see Section C below) for a temporary three-month period. This Transitional Spectrum Licence was issued:

for the sole and exclusive purpose of enabling the Licensee the ability to reorganize its network in an efficient manner and minimize the impact that the expiration of this transitional spectrum licence may have on its operations.⁵

2 Summary of the Authority's Conclusions

9. The Authority has concluded that BDC is making efficient use of its spectrum assignments above 1 GHz in the 1900 and 3500 MHz bands.
10. The Authority has further concluded that BDC is not efficiently using 2 x 12.5 MHz (i.e., half) of its assignments in the 850 MHz band. Its 850 MHz band assignment constitutes 100 percent of the commercially usable spectrum in this high-value band. The Authority considers that BDC has failed to demonstrate a "reasonable need" for this spectrum, and that reclamation is a necessary measure to ensure the efficient use of spectrum pursuant to ECA Section 78.
11. The Authority considers that the optimal solution for BDC is to vacate the A and A' Blocks⁶ within the 850 MHz band (collectively referred to as the "A Blocks") following a reasonable migration period of 90 days. However, if it is BDC's preference instead to vacate the B and B' Blocks (collectively referred to as the "B Blocks"), the Authority will entertain a reasonable request from BDC if it is made in accordance with the deadlines established in the ordering clauses of this Final Decision and Order.⁷ Assuming that BDC elects to vacate the A Blocks, the Authority will: (1) extend BDC's Transitional Spectrum Licence for an additional period that is reasonable and necessary in order to permit an orderly migration by BDC; and (2) leave in place the 10-year spectrum licence covering the B Blocks.

⁵ BDC Transitional Spectrum Licence for Commercial Mobile Radio Services (003-CMR-01T), at paragraph 1.

⁶ For administrative ease throughout this document the Authority refers to the frequency ranges of 869-880 MHz paired with 824-835 MHz as the "A Block", and the frequency ranges of 890-891.5 MHz paired with 845-846.5 MHz as the "A' Block". The frequency ranges of 880-890 MHz paired with 835-845 MHz are identified as the "B Block", and the frequency ranges of 891.5-894 MHz paired with 846.5-849 MHz are identified as the "B' Block".

⁷ The Authority has relied on the assessment made by LS Telcom when setting the time period for the vacation of the A Blocks (see footnote 67 below). As indicated in Section F below, the Authority would, following a request by Digicel, be amenable to extending the 90 day migration period if Digicel can provide corroborating documentation and other convincing evidence in support of such request.

3 Overview of the Authority's Investigation

12. The Authority's investigation commenced in September 2013. As a first step, the RA retained LS Telcom, a well-regarded international consultancy based in the Europe with substantial expertise in spectrum management.⁸ LS Telcom was asked by the Authority to assist it in: (1) identifying the criteria that should be applied in determining whether spectrum is being used efficiently; and (2) carrying out a technical evaluation to determine whether any of the radio frequencies provisionally licensed to BDC (and, likewise, to other ICOL holders) are being used inefficiently, and thus subject to reclamation for refarming to other licensees.⁹
13. A Final Report was submitted by LS Telcom to the Authority in March 2014 ("LS Telcom Report"), a confidential version of which is attached to this Final Decision and Order as Annex A.¹⁰ In order to address several issues raised subsequently by BDC, the Authority requested LS Telcom to prepare a supplement to its initial report in December 2014 ("LS Telcom Supplementary Report"), which is attached to this Final Decision and Order as Annex B.¹¹
14. The Authority determined, from the outset, that it would be reasonable and proportionate¹² to focus its investigation on the "high value" frequencies or "High Demand Spectrum" ("HDS"), where the potential for demand to exceed supply is strong and there is a clear need to ensure efficient spectrum assignments.¹³ Accordingly, on 7 October 2013, the Authority issued a Notice and Information Request ("Notice") requiring ICOL holders with associated Spectrum Licences for Wireless Cable Spectrum, Commercial Mobile Radio Service Spectrum, and/or Fixed Wireless Access Spectrum¹⁴ to submit:

*a report approved by the Licensee's Board of the Directors containing a detailed analysis of spectrum usage by the Licensee, in the format prescribed by the Authority, in relation to services that were provided using the Assigned Frequencies for the Authorized Uses as at the date of the commencement of Part 12 of the ECA.*¹⁵

15. These submissions are referred to as Spectrum Efficiency and Usage Self-Assessments ("SEUSAs").
16. On 29 October 2013, BDC submitted its SEUSA analysis in accordance with the RA's Notice. On 11 November 2013, BDC submitted a document entitled "Global Spectrum

⁸ <http://www.lstelcom.com/>

⁹ LS Telcom was also requested to address migration planning for spectrum found to be inefficiently used.

¹⁰ Final Report, Assessment of spectrum efficiency of wireless service providers in Bermuda, RAB Bermuda, LS Telcom, March 25 2014. The LS Telcom Report covered the spectrum efficiency of multiple ICOL holders. The information relevant to BDC was made available to BDC in the form of the confidential draft "SEUSA Analysis" issued to BDC in April 2014, as discussed in A.3 below.

¹¹ Supplementary Report, Assessment of spectrum efficiency of wireless service providers in Bermuda, RAB Bermuda, LS Telcom, December 23 2014.

¹² These principles are set out in Sections 2 and 16(d) of the RAA.

¹³ See paragraph ("par.") 22 of ECA Section 78 Transitional Spectrum Investigation, Spectrum Efficiency and Self-Usage Assessments, Notice and Information Request, SC-1222/2013; dated 7 October 2013.

¹⁴ Excluded from the scope of this investigation were non-HDS spectrum assignments associated with Other Mobile Radio Service Spectrum Licences and Point-to-Point Microwave Spectrum Licences.

¹⁵ ECA Section 78 Transitional Spectrum Investigation, Spectrum Efficiency and Self-Usage Assessments, Notice and Information Request, SC-1222/2013, dated 7 October 2013.

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Benchmarking Study Whitepaper,” which was prepared by Altman Vilandrie & Company for BDC (“Whitepaper”).¹⁶

17. On 14 April 2014, after having considered the evidence submitted by BDC and the results of its own assessment, the Authority furnished BDC with a confidential SEUSA report containing its efficiency analysis and identifying the frequencies earmarked for recovery.¹⁷ BDC submitted comments on the Authority’s confidential SEUSA report on 9 May 2014. On 29 May 2014, representatives of the Authority and its consultants, including LS Telcom, met with BDC to discuss the spectrum in the 850 MHz band that had been identified for recovery. During the month of June 2014, the Authority issued several follow-up questions to BDC concerning the spectrum in question, to which BDC responded.
18. On 1 July 2014, the Authority provided BDC with a confidential draft of the proposed final decision relating to BDC’s spectrum holdings. Following similar exchanges with other ICOL holders, on 15 October, the Authority published on its website a document entitled “ECA Section 78 Transitional Spectrum Investigation - Draft Final Decision and Order” (the Draft Decision referred to above). This non-confidential draft of the final decision, which reflected redactions requested by BDC, addressed the spectrum assignments of all relevant ICOL holders and summarised the overall findings of the RA’s investigation. The Authority invited comments from interested parties concerning the Draft Decision. BDC, through its external counsel, was the only party to submit comments at that stage.

4 Spectrum characteristics and “efficient use”

19. Radio spectrum is a scarce national resource that is required for the provision of wireless electronic communications services, including mobile or cellular communications services. Mobile voice services have long since become an important convenience and a necessity for businesses and consumers alike. In today’s digital world, consumers are increasingly relying on mobile devices to access the Internet and a vast range of mobile data and video applications. This trend will accelerate as technologies that enable superfast broadband access are deployed by mobile operators, thus improving the quality of service and customer experience. This includes so-called fourth generation (“4G”) or Long Term Evolution (“LTE”) technology, which can support peak speeds of up to 100 megabits per second.
20. At the global level, the International Telecommunications Union (“ITU”), the international treaty organisation that is responsible for spectrum management and harmonization at the global level, has responded to consumers’ increasing demand for mobile broadband by identifying more and more spectrum for mobile broadband use. The ITU’s allocations for mobile broadband recognize the different propagation characteristics of radio frequencies at the upper and lower ends of the spectrum that are suitable for radio communications.
21. In general terms, frequencies below 1 GHz (including those in the 700 MHz and 850 MHz bands) have properties that make them more effective for transmitting over long distances (requiring relatively fewer cell-sites) and for penetrating buildings (coverage).

¹⁶ Exhibit 2 of the Exhibits submitted by BDC together with its 29 October response to the Draft Decision (“BDC Exhibits”). See: BDC Response to Draft Final Decision and Order Matter: SC-1222-2013 Comments on ECA Section 78 Transitional Spectrum Investigation (dated 29 October 2014) (“BDC Response to the Draft Decision”).

¹⁷ ECA Section 78 Transitional Spectrum Investigation - BDC Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013, dated 14 April 2014.

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Frequencies above 1 GHz (including the 1900 MHz and 3500 MHz bands) are more suitable for transmitting large amounts of data (requiring relatively more cell-sites), and allow cell-sites to be placed closer together. The favourable characteristics of the sub 1 GHz spectrum, including the 850 MHz band, are discussed in Section 5.2 of the LS Telcom Supplementary Report.

22. Having access to reasonable amounts of spectrum above and below 1 GHz is therefore important to the efficient operation of a mobile network. As the US Federal Communications Commission (“FCC”) has observed, “not all spectrum is created equal.”¹⁸ In a recently issued Report and Order, the FCC observed that:

*Spectrum below 1 GHz has, compared to spectrum above 1 GHz, distinct propagation advantages for network deployment over long distances, while also reaching deep into buildings and urban canyons. High-band spectrum is more plentiful and possesses certain technical advantages allowing for the transmission of large amounts of information. In this sense, spectrum below 1 GHz may be thought of as “coverage” spectrum, and high-band spectrum may be thought of as “capacity” spectrum. While other cost-related factors exist, **ensuring that multiple providers are able to access a sufficient amount of low-band spectrum is a threshold requirement for extending and improving service in both rural and urban areas.***¹⁹ (emphasis added)

23. Bermuda falls within Region 2 of the spectrum management areas delineated by the ITU Radio Regulations. Region 2 also encompasses the United States. Because of the size and proximity of the US market, the number of cellular equipment manufacturers located there or catering to the US market, the number of American travellers to Bermuda, and the leadership of the FCC in spectrum management, Bermuda has historically followed the US lead on spectrum allocation and assignment. As a result, and in addition to the natural propagation characteristics of spectrum, the commercial characteristics of end user devices and network infrastructure that are compatible with the US spectrum band plan must also be taken into account when considering the relative importance, value and uses of particular bands of spectrum above and below 1 GHz in Bermuda.
24. As noted above, ECA Section 37 imposes a set of objectives for the management of spectrum. Among other things, spectrum must be managed in a manner that is both technically and economically efficient (Section 37(1)(b) ECA). These two aspects of efficiency are symbiotic insofar as the technically efficient use of spectrum is critical to ensuring the economically efficient use of this scarce resource. If a licensee is using spectrum that is in high demand in a technically inefficient way, there is a substantial opportunity cost if actual or potential competitors are, as a result, denied the ability to use this valuable resource to serve their own customers.
25. The inefficient use of spectrum can also impact a competitor’s cost of providing mobile services by necessitating a more expensive network configuration than that used by a licensee that is inefficiently spreading its service across more frequencies, but using fewer base stations, than are reasonably required to provide the service. It also can impair the quality of service that competitors are able to offer consumers (slower speeds, dropped calls, etc.). The cost and quality of service issues associated with rivals’ inability

¹⁸ FCC Mobile Spectrum Holdings Report and Order, FCC 14-63 (Released: 2 June 2014), par.3; <http://www.fcc.gov/document/mobile-spectrum-holdings-report-and-order>

¹⁹ *Ibid.*

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to access spectrum can therefore have a harmful impact on competition and, ultimately, on consumers.

26. Ensuring the technical and economic efficiency of spectrum is a priority of spectrum authorities and governments around the world.²⁰ The efficiency requirement of ECA Section 78, viewed from a technical perspective, has a well understood meaning in terms of spectrum management, and there are generally accepted ways of measuring the efficiency of spectrum utilisation, as discussed in greater detail in Section C.3 below.
27. Any stand-alone calculation of spectrum efficiency involves a ratio in which the amount of traffic (voice or data) that is being carried by a network is the key factor determining the value of the numerator, whereas the denominator reflects the amount of spectrum assigned for the particular use. There is a *prima facie* case for concluding that, for the purpose of ECA Section 78, scarce, high-demand spectrum that is not being used *at all* by an operator to which it is assigned is “inefficient”. In such cases, no traffic is being carried over the assigned spectrum, which means that the numerator of the spectrum efficiency ratio would be zero. The efficiency measure for spectrum that is unused would therefore also be zero. In addition to being technically inefficient, spectrum that is unused means that it is unavailable to other operators to use. There is thus a high opportunity cost to unused spectrum, particularly in the sub-1 GHz bands, making it both economically and technically inefficient.²¹
28. The efficiency measurement is not quite as simple in situations where a licensee is using the spectrum in question but has elected to spread the operation of its network over many more frequencies than a reasonably efficient operator would need in order to deliver the same services of the same quality to the same number of people. Where no fees are imposed for the use of spectrum (as has historically been the case in Bermuda), an operator has no incentive to utilise spectrum efficiently. The operator may, without financial penalty, spread its traffic over an unusually wide range of frequencies in order to save money on equipment costs (because fewer base stations are required).²² It may also do this as a way of keeping valuable spectrum out of the hands of its competitors (so-called “spectrum hoarding”).

B. BDC’S SPECTRUM ASSIGNMENTS ABOVE 1 GHZ

29. [✂]

C. BDC’s SPECTRUM ASSIGNMENT IN THE 850 MHZ BAND

1 Favourable characteristics of radio frequencies below 1 GHz

30. As discussed in Section A above, the 850 MHz band enjoys both favourable propagation characteristics for wide-area mobile broadband. Signals transmitted using the 850 MHz

²⁰ For example, in the EU, the Framework and Authorisation Directives (Directives 2002/21/EC and 2002/20/EC respectively) require that spectrum is used “effectively” and “efficiently” and in pursuit of consumer benefits such as economies of scale and the interoperability of services. These Directives also establish specific principles aimed at ensuring that spectrum is used in a manner that is pro-competitive and prevents the hoarding of valuable spectrum by a single (or limited number of) network operator(s) under so-called “*use it or lose it*” principles (see: Articles (“Arts.”) 9 and 5(6) of Framework and Authorisation Directives, respectively and Recital (15) and Article (“Art.”) 5 of the EU Radio Spectrum Policy Programme Decision (Decision 243/2012/EU)).

²¹ The efficiency value of unused spectrum is also addressed in Section 3 of the LS Telcom Supplementary Report (Annex B).

²² [✂]

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spectrum allow for coverage²³ over greater distances and better indoor penetration²⁴ for mobile devices than those transmitted using spectrum in frequency bands above 1 GHz.

31. Networks transmitting over the 850 MHz band also require less physical infrastructure build-out, i.e., base-stations. The cost of rolling out an electronic communications network using a mix of the 850 MHz band and frequencies above 1 GHz is therefore considerably lower than the costs incurred by operators with access only to frequency bands above 1 GHz.²⁵ A recent study conducted for Ofcom in the UK in 2013 indicated that the commercial value to network operators of spectrum below 1 GHz was approximately double that above 1 GHz due to these differences.²⁶ The same differences apply equally to Bermuda, as to any other country, as they are caused by the fundamental physical characteristics of the radio spectrum.
32. There is also an important commercial advantage associated with the 850 MHz band as compared with other spectrum bands below 1 GHz (such as the 700 MHz band). Equipment manufacturers catering to the US market have designed handsets capable of providing traditional voice services using the 850 MHz band. As a result, this band can be used for both traditional mobile voice service (provided using second and third generation or 3G technologies) and high-speed mobile data services using 3G and 4G/LTE technology. The availability of equipment compatible with use of the 850 MHz band for traditional voice services is important because so-called voice over LTE (“VoLTE”) services are still under development.²⁷
33. The 850 MHz band therefore currently enjoys a significant advantage over the 700 MHz band, which also has been allocated for mobile broadband use and can support high-speed mobile broadband services over LTE, but cannot currently support traditional mobile voice telephony. The timing of the commercial availability of equipment that can accommodate any-to-any mobile voice communications over LTE remains uncertain.
34. This means that, if a mobile operator’s only sub-1 GHz assignment is in the 700 MHz band, it will not be able to offer voice services that are comparable to a competing operator that has an assignment in the 850 MHz band, which supports both LTE and robust second and third generation voice technologies that allow any-to-any calling. Therefore, although the Authority is in the process of making a significant amount of

²³ Coverage refers to the area served by each cell in a mobile network. All else equal, cells using lower frequency spectrum are generally larger than those using higher frequency spectrum.

²⁴ Indoor penetration refers to the ability of radio signals to pass from the cell-site through solid objects such as walls and windows to a mobile device, and vice versa.

²⁵ The results of a recent (and independent) market survey carried out for the RA (November 2013) underline the importance of 1 GHz spectrum in this regard. This survey found that, when compared to Digicel, for example, BDC has higher service quality and fewer dropped calls. [X] See: Bermuda Mobile Market Study Research Results for Bermuda Regulatory Authority, November 2013, pp. 56 – 60 and p. 76;

<http://www.rab.bm/images/PDF/Regulatory-Authority-Market-Study-Mobile-Research-Results-Revised-December%209%202013%20FINAL.pdf>

²⁶ See: International benchmarking of 900 MHz and 1800 MHz spectrum value, Final Report for Ofcom, September 2013;

<http://stakeholders.ofcom.org.uk/binaries/consultations/900-1800-mhz-fees/annexes/benchmarking.pdf>

²⁷ VoLTE services are currently subject to significant technical limitations, and only permit “in-network” calling to VoLTE capable devices. In other words, VoLTE does not allow a user of Network A to make a call to a user of Network B (so-called “any-to-any” calling), but only allows for the making of calls “in network” to another VoLTE capable device on Network A.

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bandwidth (2 x 29 MHz) in the 700 MHz band available for assignment,²⁸ this spectrum cannot currently be considered as a reasonable substitute for an assignment in the 850 MHz band, given the current service limitations in respect of mobile voice provision using the 700 MHz band. The commercial value of the 850 MHz band vis-à-vis the 700 MHz band is also discussed in Section 5.2 of the LS Telcom Supplementary Report.

2 Basis for current assignment of the 850 MHz band in Bermuda

35. [X]

3 BDC's inefficient use of the 850 MHz Band

3.1 Efficiency investigation process

36. In order to assess BDC's spectrum efficiency in the 850 MHz, 1900 MHz and 3500 MHz bands, the Authority has relied on the results of a technical evaluation and benchmarking study conducted by LS Telcom. Both are addressed in the LS Telcom Report.

(a) Technical investigation

37. The measurement of spectrum efficiency can be undertaken in several different ways. Based on the recommendations of LS Telcom, the Authority has relied on the following metrics for the purpose of assessing whether BDC is making "efficient use" of its spectrum assignments from a technical perspective:

- the extent to which the network design follows engineering best practice for an efficient operator; and
- a comparison of the relative reliance of a network on spectrum versus infrastructure in delivering the service.

38. These metrics are discussed in greater detail in the LS Telcom Report and the Confidential Draft SEUSA Analysis (the Authority provided the latter to BDC on 14 April 2014).

(i) Engineering best practice

39. For a network operator using spectrum efficiently, certain engineering parameters should be evident. In particular, the use of the spectrum should be such that no frequency is used to excess whilst others are rarely (if ever) used. The distribution of cell sites should also closely follow the density of subscribers.

40. When evaluating spectrum efficiency, the design and dimensioning of the networks are taken into account. Accordingly, when undertaking its technical assessment of BDC's spectrum usage, LS Telcom sought to determine whether BDC's networks are:

- designed in a way that makes effective use of the spectrum available to them (i.e., that they are not wasteful in their use of spectrum); and

²⁸ The 700 MHz Band is currently assigned to WOW for the provision of wireless cable television service. The Authority is in the process of consulting with WOW over its migration out of this band so that the spectrum may be reassigned to other licensees to provide mobile services. See footnote 1 above.

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- correctly dimensioned to deal with traffic they carry (i.e., there is neither significant unused capacity, nor are the sites too heavily loaded which would reduce service quality).²⁹

(ii) Infrastructure versus spectrum reuse

41. The degree to which each network operator is efficiently reusing its spectrum is an indicator of how efficiently it is using that spectrum in comparison with selected benchmark countries.
42. Generally speaking, additional capacity on a wireless network can be created in two ways: (1) by increasing the amount of spectrum used by the network (for a given number of cell sites); or (2) by increasing the number of cell sites (for a given assignment of spectrum). The latter approach is referred to as *spectrum reuse*. In practice, spectrum reuse is achieved by employing identical frequencies (or channels) in multiple cell locations, but ensuring that the cells using these identical frequencies are geographically separated in order to reduce (or eliminate) harmful interference between identical cells.
43. From an efficiency perspective, spectrum reuse is an important consideration because it enables a wireless network operator to significantly increase the number of customers that can be served, and the amount of information that can be transmitted using a fixed amount of spectrum. Therefore, the greater the spectrum reuse that can be observed for a particular wireless network and spectrum assignment, the more efficiently the wireless network operator is using the spectrum in question.

(iii) Results of the Technical Assessment

44. [X]

(b) Benchmarking study

(i) Choice of benchmark countries

45. To provide an independent check on its assessment, LS Telcom also undertook a benchmarking study to compare the efficiency of the network design of BDC's GSM and UMTS networks with those of operators in reasonably comparable countries.³⁰
46. Bermuda's small size, small population and high GDP establish a relatively unusual profile for benchmarking purposes. The table below provides examples of possible benchmarks that were considered by LS Telcom.

²⁹ LS Telcom Report, pp. 4 – 5.

³⁰ See Section 2 of the LS Telcom Supplementary Report (Annex B) for a discussion on benchmarking spectrum efficiency.

Table 2: Possible benchmark countries for Bermuda when considering spectrum efficiency

Country	Area (km ²)	Population	GDP per Capita (US\$)
Aruba	180	103000	25000
Bermuda	53	65000	84000
Cayman	259	58000	30000
Guernsey	78	65000	45000
Jersey	119	98000	57000
Liechtenstein	160	35000	135000
San Marino	62	32000	36000

47. The closest benchmark to Bermuda is Guernsey, which has a similar population but a slightly larger area. The next closest is Jersey. Although the other countries cited in the table above could also be used as benchmarks, the significant differences in area, population or gross domestic product (“GDP”) (together, in the case of Lichtenstein and San Marino with the fact that they are not island nations)³¹ means that additional correction factors would need to be introduced making the results less reliable. There are also other issues such as topography (undulation of the terrain, e.g., flat versus hilly) and morphology (type of terrain, e.g., urban versus forested area) that would need to be considered if accuracy was critical, however for the purposes of benchmarking, population, area and GDP are usually the key factors.

48. LS Telcom discusses in detail the reasons for its choice of benchmark countries in Section 2.2 of the Supplementary LS Telcom Report.

(ii) Results of benchmarking study

49. [X]

3.2 Conclusions of the Authority’s Efficiency Investigation

50. [X]

4 BDC’s failure to demonstrate a “reasonable need” for the spectrum identified for recovery within the 850 MHz band

51. [X]

5 Necessity to recover BDC’s 850 MHz spectrum to ensure its efficient use

52. [X]

6 Proposed vacation of the A Blocks

53. [X]

³¹ Spectrum efficiency on an island is not affected by adjustments that may otherwise be required to deal with interference from bordering countries.

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D. COMPATIBILITY OF ECA SECTION 78 INVESTIGATION RESULTS WITH THE MINISTER'S SPECTRUM POLICY STATEMENT

54. Section 35 of the ECA requires the Minister responsible for telecommunication to make general policies and, as necessary, regulations for the electronic communications sector with respect to the management and allocation of spectrum and procedure to be followed by the Authority when assigning spectrum.
55. On 22 September 2014, the Minister for Education and Economic Development published a Policy Statement (the "Statement") that sets out the spectrum management policies to be implemented by the Authority with respect to spectrum allocations, spectrum assignments, and spectrum related fees.³² The effective date of the policies contained in the Statement is 22 September 2014.
56. The Statement addresses a number of fundamental spectrum management issues, including those set out below.
- a) The definition of the HDS bands.³³ These frequencies are those whose propagation characteristics make them particularly valuable for mobile voice and broadband services and, as a result, the potential for which is likely to exceed supply. For these frequencies, the policy set out in the Statement is designed to ensure efficient use in keeping with the ECA's objectives, and in consideration of the importance of radio spectrum as a scarce national resource and a public good.
 - b) The establishment of a spectrum cap on all HDS assignments such that no firm, or affiliates (as defined in the ECA or the RAA can be permitted to hold more than 50 percent of any HDS band, subject to the limited exceptions described by the Minister.³⁴
 - c) The establishment, for the HDS frequencies, of a Bermuda frequency allocation table ("FAT") and a Bermuda band plan ("BBP") based on the frequency allocations and band plans adopted by the FCC.³⁵
 - d) The establishment of a hybrid first-come-first-served ("FCFS")-Comparative Selection assignment process for all HDS frequencies.³⁶
 - e) The establishment of an administered incentive pricing ("AIP") scheme with the goal of incentivising efficient use of spectrum for all HDS bands.³⁷
57. The Statement establishes a spectrum cap on all HDS assignments such that no firm, or affiliate (as defined in the ECA or RAA) is permitted to hold more than 50 percent of any HDS band, subject to the limited exceptions described by the Minister.³⁸ The Minister

³² Spectrum Policy Statement by Dr. the Hon. E. Grant Gibbons, JP, MP, Minister of Education and Economic Development, 22 September 2014 (the "Statement");

http://www.gov.bm/portal/server..pt/disclaimer.html/skin/ggambo62...n_hi_userid=2/gateway/PTARGS_0_2_6079_330_1813_43/http%3B/ptpublisher.gov.bm%3B7087/publishedcontent/publish/min_telecom_and_e_commerce/telecommunications/dept_telcom_press_releases/spectrum_policy_statement_0.pdf

³³ *Ibid*, Section 3.1.

³⁴ *Ibid*, Section 3.3.1.3.

³⁵ *Ibid*, Section 3.2.

³⁶ *Ibid*, Section 3.3.

³⁷ *Ibid*, Section 3.4.

³⁸ *Ibid*, Section 3.3.1.3.

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considered that the establishment of a 50 percent cap in this manner is sufficient to permit at least two licensees to operate network in each band, and that the cap is consistent with the spectrum management objectives set out under Section 37 ECA.³⁹

58. BDC is currently assigned 2 x 25 MHz of spectrum in the 850 MHz band. By reclaiming 2 x 12.5 MHz of this spectrum, constituting either the A Blocks or the B Blocks, the Authority's action will reduce BDC's current assignments in the 850 MHz band to 50 percent of the available spectrum in this band. The Authority's decision following its ECA Section 78 investigation is therefore compatible with the policy set by the Minister.

E. PROCEDURAL ISSUES RAISED BY BDC

59. In its submission of 29 October, BDC has raised a number of questions about the procedures followed by the Authority in conducting the investigation that has led to this Final Decision and Order.⁴⁰

60. The Authority has made every effort to inform itself of the views of all stakeholders in this proceeding in the interests of fairness and transparency. The Authority has expended considerable time and resources in analyzing and formulating its views on the evidence submitted by BDC and other interested parties, together with the technical evaluations and benchmarking studies prepared by LS Telcom. By any measure, this investigation has been conducted in a fair and reasonable manner, with due consideration having been given to reasonable requests for the confidential treatment of commercially sensitive information.

61. The specific issues raised by BDC in this regard and that are relevant to this proceeding are addressed below.⁴¹

(a) Application of the *ex parte* rules

62. BDC claims that the Authority has failed to comply with the *ex parte* requirements that apply under RAA Section 73. In particular, BDC argues that the Authority has applied these rules in a discriminatory fashion that has prejudiced BDC in the current proceeding. The various arguments raised by BDC in this regard are summarized below, followed by the Authority's response.

(i) The *ex parte* rules did not apply to the investigative and fact finding activities conducted by the Authority prior to the issuance of the Draft Decision.

63. Section 78 establishes a "one-time" process under the transitional provisions of the ECA in that it allows the Authority to reclaim spectrum following the undertaking of an "investigation", and without the need to conduct a formal adjudication or consultation.⁴² The ECA therefore gives the Authority significant procedural latitude in terms of how it chooses to conduct the transitional spectrum investigation under Section 78 ECA.⁴³

³⁹ *Ibid*, par. 143.

⁴⁰ BDC Response to the Draft Decision, pp. 25 – 31.

⁴¹ Allegations relating to communications with the DOT are outside the scope of this proceeding.

⁴² In future, and pursuant to ECA Section 41, the Authority will be required to conduct an adjudication prior to reclaiming spectrum.

⁴³ The undertaking of the transitional spectrum investigation by the Authority for the purposes of ECA Section 78 is governed by RAA Section 89(1)(d), which states that the Authority may initiate an investigation "for any purpose provided for in sectoral legislation".

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64. RAA Section 60(1) confirms that the RA can engage in information-gathering activities without commencing a public consultation or adjudication (within the meaning of Part 6 of the RAA). Moreover, RAA Section 60(2) makes it clear that any communication made to the RA prior to the commencement of a public consultation or adjudication is not “subject to the restriction on *ex parte* communications.” In the present case, the RA was not required to – and did not – initiate a public consultation. The Authority nonetheless chose to confer with stakeholders and post on its website certain communications exchanged with the various stakeholders during the period it was undertaking its investigation. However, in the absence of a public consultation or adjudication, the *ex parte* rules were not applicable. The RA was not obligated to disclose all communications made to it during the investigation, many aspects of which have involved commercially sensitive and otherwise confidential information provided by each of the licensees under review. In any event, BDC has had ample opportunity to make its case to the Authority and the Authority has considered all pertinent issues objectively.⁴⁴

(ii) BDC has not been prejudiced by the disclosure of its *ex parte* communications.

65. BDC asserts that it has been prejudiced by the disclosure of its *ex parte* filings. Even if the *ex parte* rules did apply, the disclosure of BDC’s *ex parte* filings has not prejudiced this operator *vis-à-vis* the other participants in the current proceeding, and BDC has not explained why it believes its interests have been harmed. The communications in question did not in any way refer to, or otherwise disclose, any information of a sensitive nature relating to this proceeding.⁴⁵

(b) The Authority did not improperly disclose information to Digicel.

66. BDC also argues that the Authority improperly disclosed information to Digicel relating to the current proceeding and that this prejudiced BDC’s interests. In particular, BDC alleges that Digicel had advance notice of the contents of the Draft Decision, and that the Authority “discussed legal strategy” with Digicel. These claims are without merit.

(i) The Authority did not provide Digicel with advance notice of the contents of the Draft Decision.

67. BDC contends that Digicel had advance knowledge of the contents of the Draft Decision, in particular, the Authority’s preliminary decision to reclaim a portion of the 850 MHz band. BDC relies on a short fragment of a letter sent by Digicel to the Authority on 11 September 2014 as evidence of this.⁴⁶ The inferences drawn by BDC from Digicel’s letter are completely misplaced. While it is true that Digicel’s letter urged the RA to take back and reassign part of the 850 MHz band, this was a position that Digicel had been publicly advocating for some time and was not related to any “advance disclosure” of the contents of the Draft Decision by the Authority.⁴⁷ Furthermore, Digicel’s assumption that BDC might be interested in using spectrum in the 850 MHz band to deploy LTE services was a

⁴⁴ The RA has in any event disclosed all *ex parte* communications regarding this matter.

⁴⁵ The 23 July 2014 letter simply stated that, at a meeting held on 7 July, BDC’s representative “reiterated information contained in the public filings of Bermuda Digital Communications” and “discussed current and future spectrum use of BDC, technology and infrastructure decisions, and current and future services.” The 9 September 2014 letter contained exactly the same language, along with the statement that BDC’s representative had discussed “[t]he RA’s authority and rationale concerning certain proposed actions” and urged the RA to “carefully consider” BDC’s submissions and its “demonstrated commitment to new technology deployment”. Finally, the 10 October 2014 letter simply requested to extend the comment period following the issuance of the Draft Decision.

⁴⁶ Misdated 7 August.

⁴⁷ [✂]

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rather obvious one, given the advantages of that particular band for the provision of such services, as discussed in Section A.4 above.

- (ii) The Authority did not conduct any inappropriate discussions with Digicel regarding potential future litigation.

68. BDC also alleges that the RA informed Digicel that BDC “will challenge the [current proceeding] legally.” Here, again, BDC’s concerns are wholly unfounded. The Authority did not discuss a “legal strategy” with Digicel concerning potential litigation involving this matter that might be initiated by BDC in the future, nor have there been any public declarations by either party on this issue.⁴⁸

- (c) The Authority did not disclose BDC’s “commercially sensitive business information.”

69. BDC asserts that the RA “apparently breached” its duty to protect the confidentiality of commercially sensitive business information by informing Digicel that BDC intended to deploy LTE with its 850 MHz spectrum. BDC has made this allegation on the basis of Digicel’s statement in its 11 September letter that it was concerned that “CellOne [BDC] is either allowed to utilize the 700 MHz or continues with its existing 850 MHz [...] to launch LTE”.

70. It is common knowledge that, owing to their favourable allocation and propagation characteristics, the 700 MHz and 850 MHz bands are suited to LTE deployment. It can only be expected, therefore, that stakeholders would speculate as to the possibility of BDC deploying LTE in one or both of these bands. Indeed, the speculative nature of the comments relied on by BDC actually demonstrates that Digicel did not know whether BDC plans to use the 700 MHz or the 850 MHz band to deploy LTE.

- (d) The Authority did not allow enough time for the affected parties to comment on the Draft Decision and gave itself insufficient time to consider comments received.

71. BDC argues that the Authority has “offered insufficient time for comment and consideration in its rush to judgment”, thus “calling into question whether it will be able to engage in reasoned decision-making in this proceeding”. BDC specifically refers in this regard to the two-week period allowed by the Authority for the submission of comments on the Draft Decision.

72. The Authority wishes to point out that it has been conferring with BDC and other relevant stakeholders during the entire period of the ECA Section 78 Investigation. In fact, the first contact made by the Authority on this issue occurred on October 7 2013 when the Notice was sent out to the relevant ICOL holders. The Authority next provided BDC with its Confidential Draft SEUSA Analysis on 14 April 2014,⁴⁹ which included the Authority’s internal analysis of BDC’s spectrum efficiency and the BDC spectrum assignments which had been tentatively identified for recovery by the Authority pursuant to Section 78 ECA. On 9 May 2014, BDC provided its response to the Confidential Draft SEUSA Analysis, and on 29 May 2014. BDC met with representatives of the Authority in a “one-on-one”

⁴⁸ The Authority is also on the record as having clarified that Digicel was mistaken in attributing to the Authority the assumption that BDC would challenge this Final Decision and Order. See the Authority’s correspondence to Digicel of 18 September as set out in the Digicel *Ex parte* Communication Notice (13 October 2014).

⁴⁹ ECA Section 78 Transitional Spectrum Investigation - BDC Confidential Draft SEUSA Analysis; Notice Matter: SC-1222/2013; dated 14 April 2014.

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meeting to discuss spectrum that it had identified for recovery.⁵⁰ On 4 June 2014, the Authority issued follow-up questions to BDC, to which BDC provided responses on 13 June 2014.

73. Finally, BDC was provided with a public disclosure review version of the Draft Decision on 1 October 2014. This meant that BDC had a further two weeks (in addition to the two week consultation period) to consider the Authority's tentative conclusions and reasoning.⁵¹
74. BDC also argues that the two week period that the Authority has allowed itself to consider the comments submitted is insufficient. In fact, the Authority has taken longer than expected to complete its consideration of the evidence and prepare this Final Decision -- a total of eight weeks since receiving BDC's comments. Considering that this proceeding has been ongoing since September 2013, there should be no concern that the Authority has in any way failed to give due consideration to any of the issues raised.

F. FINAL DECISION AND ORDERING CLAUSES

1. Based on the results of the investigation undertaken pursuant to ECA Section 78, the Authority concludes that BDC is not currently making efficient use of 2 x 12.5 MHz of spectrum in the 850 MHz band currently assigned to it and, further, that BDC has not demonstrated a reasonable need for this spectrum.
2. The Authority has determined, in conformity with ECA Section 78, that in order to ensure the efficient use of this spectrum, it is necessary to reclaim this spectrum so that it can be made available for use by other licensees.
3. Therefore, BDC's Transitional Spectrum Licence for Commercial Radio Services (003-CMR-01T), covering the A Blocks, will not be renewed following a reasonable extension of the existing expiry date of 28 January 2015 to permit an orderly migration. BDC's Transitional Spectrum Licence will be extended by two months, until 31 March 2015, to allow 90 days for it to vacate the 2 x 2.5 MHz of bandwidth currently being used, albeit inefficiently used, in the A Blocks and migrate its services to the B Blocks.
4. The Authority will allow BDC until no later than 5pm local time on Friday 9 January 2015 in which to request: (1) vacation of the B Blocks instead of the A Blocks; and/or (2) a migration period longer than 90 days, accompanied by evidence in support of its request.

ORDERING CLAUSES

5. The Authority has issued and hereby affirms the continued validity of the following Spectrum Licences to BDC for a ten year term with expiry dates of 29 October 2024: a Spectrum Licence for Commercial Mobile Radio Services (003-CMR-01), a Spectrum Licence for Fixed Wireless Access Services (003-FWA-01); and a Spectrum Licence for Microwave Point-to-Point Services (003-MPP-01).
6. Pursuant to ECA Section 78, BDC's Transitional Spectrum Licence for Commercial Radio Services (003-CMR-01T), which covers only the 2 x 12.5 MHz of the 850 MHz spectrum that BDC is not currently using efficiently or at all (Mobile to Base Station frequencies 824.0 MHz – 835.0 MHz and 845 MHz – 846.5 MHz and Base Station to

⁵⁰ Representatives of BDC and the Authority also participated via conference call.

⁵¹ The public disclosure review version of the Draft Decision only differed from the Draft Decision itself in terms of the material that BDC objected to on the basis of confidentiality claims.

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Mobile frequencies 869.0 – 880.0 and 890.0 – 891.5), shall be extended from 28 January 2015 until 31 March 2015. Thereafter, this licence shall not be renewed, extended or re-issued.

7. BDC shall vacate all frequencies currently in use in the A and A' Blocks (Mobile to Base Station frequencies 824.0 MHz – 835.0 MHz and 845 MHz – 846.5 MHz and Base Station to Mobile frequencies 869.0 – 880.0 and 890.0 – 891.5) no later than 31 March 2015.
8. BDC shall inform the Authority of the planned date and time of its migration of service from the A Blocks to the B Blocks and cooperate with the Authority in ensuring that customers are informed of the migration date at least 15 days in advance in a manner to be approved by the Authority.
9. BDC may, no later than 5pm local time on Friday 9 January 2015, request: (1) vacation of the B Blocks instead of the A Blocks, provided that this will not cause undue delays in the migration timetable; and/or (2) a migration period longer than 90 days, accompanied by corroborating documentation and other convincing evidence in support of its request.

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Annex A

LS Telcom Report (25 March 2014)



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Annex B

LS Telecom Supplementary Report (23 December 2014)



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Annex C

BDC's Confidential Draft SEUSA Analysis (14 April 2014)

