



Commission for
Communications Regulation

Information Notice

GSM Liberalisation Project: Publication of correspondence and other material provided by interested parties (and ComReg's written responses to same) relating to MBSA process dating from 13 July 2012 to 3 January 2013

Document No:	13/29e
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A.1 Non-confidential correspondence and other material provided by interested parties (and ComReg’s written responses to same) relating to MBSA process dating from 13 July 2012 to 3 January 2013. Presented in six volumes (a – f).

Document 13/29a

1. ComReg: letter to Telefonica “Bidder Materials and mock auctions for Multi-Band Spectrum Award” [Redacted] (letter dated 26 July 2012)
2. ComReg: letter to Telefonica “Deposit” [Redacted] (letter dated 26 July 2012)
3. ComReg: letter to Telefonica “MBSA Application Clarifications” [Redacted] (letter dated 8 August 2012)
4. ComReg: letter to Telefonica “Review of MBSA Application” [Redacted] (letter dated 24 August 2012)
5. ComReg: letter to Telefonica “Multi-Band Spectrum Award – Adjustment to the auction timetable” (letter dated 14 September 2012)
6. ComReg: letter to Telefonica “Amendment to ComReg Document 12/52 Information Memorandum (“IM”)” (letter dated 20 September 2012)
7. ComReg: letter to Telefonica “ComReg’s letter to you of the 14 September 2012” (letter dated 27 September 2012)
8. ComReg: letter to Telefonica “Updated Bidder Materials for Multi-Band Spectrum Award” [Redacted] (letter dated 3 October 2012)
9. A&L Goodbody: letter to ComReg “Multi-Band Spectrum Auction - 800 MHz, 900 MHz & 1800 MHz (“the Auction”)” (letter dated 31 October 2012)
10. Irish Independent: Article “State can make €333m in digital switch” (article dated 25 October 2012)
11. Public Policy.ie: Article “Budget 2013 – Saorview Switchover a Windfall for Government” (article dated 24 October 2012)
12. ComReg: letter to A&L Goodbody “Multi-band Spectrum Auction – 800 MHz, 900 MHz & 1800 MHz” (letter dated 1 November 2012)
13. ComReg: letter to Telefonica “Article entitled “*Low phone use puts O2 on hold*” (letter dated 31 October 2012)
14. Sunday Times: Article “Low phone use puts O2 on hold” (article dated 28 October 2012)
15. Telefonica: letter to ComReg “Letter dated 31st October 2012” (letter dated 1 November 2012)
16. ComReg: letter to Telefonica “MBSA – Deposit Call” [Redacted] (letter dated 2 November 2012)
17. Telefonica: letter to ComReg “Deposit Call” [Redacted] (letter dated 2 November 2012)
18. ComReg: letter to Telefonica “Deposit Call” [Redacted] (letter dated 6 November 2012)
19. ComReg: letter to Telefonica “MBSA – Receipt of Deposit Call” [Redacted] (letter dated 8 November 2012)
20. ComReg: letter to Telefonica “Telefonica’s participation in the MBSA process” (letter dated 15 November 2012)
21. ComReg: letter to Telefonica “MBSA process” (letter dated 20 November 2012)
22. ComReg: letter to Telefonica “Return of Surplus Deposit plus Interest Earned” [Redacted] (letter dated 22 November 2012)

23. Telefonica: letter to ComReg “Deposit Interest” [Redacted] (letter dated 28 November 2012)
24. ComReg: letter to Telefonica “Deposit Interest” [Redacted] (letter dated 30 November 2012)
25. ComReg: letter to Telefonica “Return of Additional Interest Earned” [Redacted] (letter dated 30 November 2012)
26. ComReg: letter to Telefonica “End of Assignment Stage and Auction” (letter dated 5 December 2012)
27. Telefonica: letter to ComReg “MBSA Assignments” (letter dated 28 November 2012)
28. ComReg: letter to Telefonica “MBSA process” (letter dated 4 December 2012)
29. ComReg: letter to Telefonica “Entitlement to apply for a Preparatory and a Liberalised Use Licence” (letter dated 18 December 2012)

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30. ComReg: letter to Vodafone “Joint Venture arrangement between Vodafone Ireland Limited and Hutchinson 3G Ireland Limited” (letter dated 13 July 2012)
31. ComReg/Vodafone: Email exchange between Vodafone and ComReg “Draft Response regarding query / Strictly Confidential: ComReg MBSA Application form (ComReg document 12/52aR)” (final email dated 13 July 2012)
32. ComReg: letter to Vodafone “Bidder Materials and mock auctions for Multi-Band Spectrum Award” [Redacted] (letter dated 26 July 2012)
33. ComReg: letter to Vodafone “Deposit” [Redacted] (letter dated 26 July 2012)
34. ComReg: letter to Vodafone “MBSA Application Clarifications” [Redacted] (letter dated 8 August 2012)
35. Vodafone: letter to ComReg “Vodafone Questions and Requests Following MBSA Mock Auction” [Redacted] (letter dated 15 August 2012)
36. ComReg: letter to Vodafone “Letter of 15th August” (letter dated 15 August 2012)
37. ComReg: letter to Vodafone “Review of MBSA Application” [Redacted] (letter dated 24 August 2012)
38. Vodafone: letter to ComReg “Vodafone’s Second Mock Auction” (letter dated 7 September 2012)
39. ComReg: letter to Vodafone “ComReg Multi-Band Spectrum Award (MBSA) Process – Vodafone’s second mock auction of 7 September 2012” (letter dated 10 September 2012)
40. Vodafone: emails to ComReg “MSA” (emails dated 13 September 2012)
41. ComReg: letter to Vodafone “Email of the 13 September” (letter dated 14 September 2012)
42. ComReg: letter to Vodafone “Multi-Band Spectrum Award – Adjustment to the auction timetable” (letter dated 14 September 2012)
43. ComReg/Vodafone: Email exchange between Vodafone and ComReg “Multiband Spectrum Auction: ComReg Publication of Spectrum Correspondence” (final email dated 12 September 2012)
44. Vodafone: letter to ComReg “Multi-Band Spectrum Award Process” (letter dated 12 September 2012)
45. ComReg: letter to Vodafone “Multi-Band Spectrum Award – file formats” (letter dated 18 September 2012)

46. Vodafone: letter to ComReg “Multi-Band Spectrum Release: Outstanding Technical Issues” (letter dated 18 September 2012)
47. ComReg: letter to Vodafone “Multi-Band Spectrum Release: Outstanding Technical Issues” [Redacted] (letter dated 20 September 2012)
48. ComReg: letter to Vodafone “Amendment to ComReg Document 12/52 Information Memorandum (“IM”)” (letter dated 20 September 2012)
49. ComReg: letter to Vodafone “ComReg’s letter to you of the 14 September 2012” (letter dated 27 September 2012)
50. Vodafone: letter to ComReg “Mock Auction for Multi-Band Spectrum Award Process (“Mock Auction”)” [Redacted] (letter dated 2 October 2012)
51. ComReg: letter to Vodafone “Mock Auction for Multi-Band Spectrum Award Process” (letter dated 3 October 2012)
52. ComReg: letter to Vodafone “Updated Bidder Materials for Multi-Band Spectrum Award” [Redacted] (letter dated 3 October 2012)
53. Vodafone: letter to ComReg “Updated Bidder Materials for Multi-Band Spectrum Award (“MBSA”)” (letter dated 8 October 2012)
54. ComReg: letter to Vodafone “Updated Bidder Materials for Multi-Band Spectrum Award (“MBSA”)” (letter dated 11 October 2012)
55. Vodafone: letter to ComReg “Updated Bidder Materials for Multi-Band Spectrum Award” (letter dated 12 October 2012)
56. ComReg: letter to Vodafone “Updated Bidder Materials for Multi-Band Spectrum Award (“MBSA”)” [Redacted] (letter dated 12 October 2012)
57. Vodafone: letter to ComReg “Multi-Band Spectrum Award (“MBSA”) Process” (letter dated 31 October 2012)
58. ComReg: letter to Vodafone “Multi-Band Spectrum Award (“MBSA”) Process” (letter dated 2 November 2012)
59. ComReg: letter to Vodafone “MBSA – Deposit Call” [Redacted] (letter dated 2 November 2012)
60. ComReg: letter to Vodafone “MBSA – Receipt of Deposit Call” [Redacted] (letter dated 7 November 2012)
61. ComReg: letter to Vodafone “Vodafone’s participation in the MBSA process” (letter dated 11 November 2012)
62. ComReg: letter to Vodafone “MBSA process” (letter dated 20 November 2012)
63. ComReg: letter to Vodafone “Return of Surplus Deposit plus Interest Earned” [Redacted] (letter dated 22 November 2012)
64. ComReg: letter to Vodafone “Return of Additional Interest Earned” [Redacted] (letter dated 30 November 2012)
65. ComReg: letter to Vodafone “End of the Assignment Stage and Auction” (letter dated 5 December 2012)
66. Vodafone: letter to ComReg “Multi-Band Spectrum Auction (“MBSA”) Process” (letter dated 21 November 2012)
67. ComReg: letter to Vodafone “MBSA process” (letter dated 23 November 2012)
68. ComReg: letter to Vodafone “Entitlement to apply for a Preparatory and a Liberalised Use Licence” (letter dated 18 December 2012)

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69. ComReg: letter to MMC “Bidder Materials and mock auctions for Multi-Band Spectrum Award” [Redacted] (letter dated 26 July 2012)
70. ComReg: letter to MMC “Deposit” [Redacted] (letter dated 26 July 2012)

71. ComReg: letter to MMC “MBSA Application Clarifications” [Redacted] (letter dated 8 August 2012)
72. ComReg: letter to MMC “Review of MBSA Application” [Redacted] (letter dated 24 August 2012)
73. MMC: letter to ComReg “Multi-Band Spectrum Award” [Redacted] (letter dated 7 September 2012)
74. ComReg: letter to MMC “Letter of the 7th September” (letter dated 14 September 2012)
75. ComReg: letter to MMC “Multi-Band Spectrum Award – Adjustment to the auction timetable” [Redacted] (letter dated 14 September 2012)
76. MMC: letter to ComReg “Multi-Band Spectrum Award – Adjustment to the auction timetable” (letter dated 18 September 2012)
77. ComReg: letter to MMC “MBSA – Adjustment to the auction timetable” (letter dated 20 September 2012)
78. ComReg: letter to MMC “Confidential – Amendment to ComReg Document 12/52 Information Memorandum (“IM”)” (letter dated 20 September 2012)
79. ComReg: letter to MMC “ComReg’s letter to you of the 14 September 2012” [Redacted] (letter dated 27 September 2012)
80. ComReg: letter to MMC “Updated Bidder Materials for Multi-Band Spectrum Award” (letter dated 3 October 2012)
81. ComReg: letter to MMC “Statement made by Mr Paul Bradley on “*The Last Word with Matt Cooper*”” (letter dated 31 October 2012)
82. MMC: letter to ComReg “Multi-Band Spectrum Award – Alleged breach of confidentiality obligations” (letter dated 1 November 2012)
83. ComReg: letter to MMC “Letter of 1 November 2012” (letter dated 2 November 2012)
84. ComReg: letter to MMC “MBSA – Deposit Call” [Redacted] (letter dated 2 November 2012)
85. MMC: letter to ComReg “Multi-Band Spectrum Auction” [Redacted] (letter dated 6 November 2012)
86. ComReg: letter to MMC “Multi-Band Spectrum Auction” [Redacted] (letter dated 7 November 2012)
87. ComReg: letter to MMC “MBSA – Receipt of Deposit Call” [Redacted] (letter dated 7 November 2012)
88. ComReg: letter to MMC “Meteor’s participation in the MBSA process” (letter dated 15 November 2012)
89. ComReg: letter to MMC “MBSA process” (letter dated 20 November 2012)
90. ComReg: letter to MMC “Return of Surplus Deposit plus Interest Earned” [Redacted] (letter dated 22 November 2012)
91. ComReg: letter to MMC “Return of Additional Interest Earned” [Redacted] (letter dated 30 November 2012)
92. ComReg/MMC: Email exchange between MMC and ComReg “MBSA – next steps” (final email dated 19 November 2012)
93. MMC: email to ComReg “T1 Licences” (email dated 20 November 2012)
94. ComReg: letter to MMC “Multi-Band Spectrum Award” (letter dated 23 November 2012)
95. MMC: email to ComReg “SUF Timing” (email dated 15 November 2012)
96. MMC: letter to ComReg “Multi-Band Spectrum Award – Notification of Lots retained for GSM purposes” (letter dated 28 November 2012)

97. ComReg: letter to MMC “Multi-Band Spectrum Award – Notification of Lots retained for GSM purposes” (letter dated 4 December 2012)
98. ComReg: letter to MMC “End of Assignment Stage and Auction” (letter dated 5 December 2012)
99. ComReg: letter to MMC “Entitlement to apply for a Preparatory and a Liberalised Use Licence” (letter dated 18 December 2012)

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100. ComReg: letter to H3GI “Joint Venture arrangement between Vodafone Ireland Limited and Hutchinson 3G Ireland Limited” (letter dated 13 July 2012)
101. ComReg: letter to H3GI “Bidder Materials and mock auctions for Multi-Band Spectrum Award” [Redacted] (letter dated 26 July 2012)
102. ComReg: letter to H3GI “Deposit” [Redacted] (letter dated 26 July 2012)
103. ComReg: letter to H3GI “MBSA Application Clarifications” [Redacted] (letter dated 8 August 2012)
104. ComReg: letter to H3GI “Review of MBSA Application” [Redacted] (letter dated 24 August 2012)
105. H3GI: letter to ComReg “COMREG DOC. NO. 12/52” (letter dated 4 September 2012)
106. ComReg: letter to H3GI “Letter of the 4th September” (letter dated 12 September 2012)
107. ComReg: letter to H3GI “Multi-Band Spectrum Award – Adjustment to the auction timetable” (letter dated 14 September 2012)
108. H3GI: letter to ComReg “COMREG DOC. NO. 12/52 – POSSIBLE ERROR” (letter dated 13 September 2012)
109. ComReg: letter to H3GI “Letter of 13 September 2012” (letter dated 20 September 2012)
110. ComReg: letter to H3GI “Amendment to ComReg Document 12/52 Information Memorandum (“IM”)” (letter dated 20 September 2012)
111. H3GI: letter to ComReg “COMREG DOC. NO. 12/52 – MOCK AUCTION ASSIGNMENT ROUND OPTIONS” (letter dated 20 September 2012)
112. ComReg: letter to H3GI “Mock Auction Assignment Round Options” (letter dated 26 September 2012)
113. ComReg: letter to H3GI “ComReg’s letter to you of the 14 September 2012” [Redacted] (letter dated 27 September 2012)
114. H3GI: letter to ComReg “COMREG DOC. NO. 12/52” (letter dated 1 October 2012)
115. ComReg: letter to H3GI “Updated Bidder Materials for Multi-Band Spectrum Award” [Redacted] (letter dated 3 October 2012)
116. H3GI: letter to ComReg “COMREG DOC. NO. 12/52” [Redacted] (letter dated 12 October 2012)
117. ComReg: letter to H3GI “Letter of 12 October” (letter dated 12 October 2012)
118. ComReg: letter to H3GI “MBSA –Deposit Call” (letter dated 2 November 2012)
119. ComReg: letter to H3GI “H3GI’s participation in the MBSA process” (letter dated 15 November 2012)
120. H3GI: letter to ComReg “MULTI-BAND SPECTRUM AWARD” (letter dated 15 November 2012)

121. ComReg: letter to H3GI “Multi-Band Spectrum Award” (letter dated 21 November 2012)
122. ComReg: letter to H3GI “MBSA process” (letter dated 20 November 2012)
123. ComReg: letter to H3GI “Return of Surplus Deposit plus Interest Earned” [Redacted] (letter dated 22 November 2012)
124. ComReg: letter to H3GI “End of Assignment Stage and Auction” (letter dated 5 December 2012)
125. H3GI: email to ComReg “MBSA – Preparatory and Test and Trial Licences” (email dated 21 November 2012)
126. ComReg: letter to H3GI “Multi-Band Spectrum Award” (letter dated 23 November 2012)
127. H3GI: letter to ComReg “MULTI-BAND SPECTRUM AWARD” (letter dated 28 November 2012)
128. ComReg: letter to H3GI “MBSA process” (letter dated 4 December 2012)
129. ComReg: letter to H3GI “Entitlement to apply for a Preparatory and a Liberalised Use Licence” (letter dated 18 December 2012)
130. ComReg: letter to H3GI “Correction to Letter of 18 December 2012” (letter dated 3 January 2013)

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131. ComReg: to All Bidders “Dot econ : Downloadable files” (Report dated 14 September 2012)
132. ComReg: to All Bidders “Dot econ Report: Eligibility-reducing relaxed primary bids in ComReg’s multiband auction” (Report dated 20 September 2012)
133. ComReg: to All Bidders “Clarification on Multi-Band Spectrum Auction” (letter dated 3 October 2012)

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134. ComReg: to All Bidders “Dot-econ: WebBidder User Manual for the Irish Multi-Band Spectrum Award” (Manual dated October 2012)
135. ComReg: to All Winning Bidders “Clarification in response to query received by ComReg” (letter dated 28 November 2012)
136. ComReg: letter to DCENR “ComReg’s Multi-Band Spectrum Award (MBSA process)” (letter dated 1 October 2012)
137. DCENR: letter to ComReg “letter of 1 October” (letter dated 16 October 2012)

131. ComReg: to All Bidders “Dot econ : Downloadable files” (Report dated 14 September 2012)

ComReg Multiband Auction 2012

Downloadable files

14 September 2012

1 Introduction

This document provides a description of the files available for bidders for downloading auction and bid data from the EAS at each stage of the auction, the information enclosed in these files, and the format of their contents. This document should be read in conjunction with the WebBidder User Manual provided to Qualified Bidders.

Note that following the mock auctions, and in response to comments received from participants, some changes have been made to these files. These changes are described upfront in Section 1.

Participation in the Auction is primarily via the main frame. All necessary information is displayed to Bidders on the main frame in a series of tables. And all inputs required from bidders are entered on the main frame. The main frame is refreshed automatically to display the relevant information and forms according to the state of the Auction. At each stage of the Auction, many of the tables displayed in the main frame can be downloaded.

In addition to the main frame, there are a series of buttons available on the control panel. With the exception of the "Log out" button, all buttons open a new browser window. Bidders will be able to download information displayed in the following windows:

- Supplementary Bids editor;
- Login History;
- Auction history; and
- Bid history.

Each of the above windows, accessed via the control panel of the EAS, informs bidders of the downloadable files available at each stage of the Auction.

In the remaining sections, we first consider the downloadable files available from the main frame of the EAS, and then discuss the files available for download from each of additional pages Bidders can access via the control panel of the EAS.

Example files for each of those described below are provided along with this document. For example files relating to downloads made from the main frame please see the folder entitled "Main frame". Any downloads made from the pages opened using the button on the control panel may be found in the folder entitled "Control Panel".

Both in this document and in the example files provided, we describe the information that would be provided to a Bidder that did not have Party-Specific Lots. Bidders who may bid for party-specific lots would also be provided with information about the party-specific lots that apply to them, which would be provided as additional Lot Category information where applicable.

2 Changes to downloadable files following the mock auctions

During the first mock auctions all information in the Excel downloadable files was formatted as text.

Following the first round of mock auctions, the following changes were made ahead of the second round of mock auctions. After the second round of mock auctions, further changes are introduced to address requests from participants to provide all numeric fields in the Excel downloadable files formatted as numbers in Excel.

Changes to 'Auction history' download:

- After the first round of mock auctions, an additional row was added. This was entitled "(Lots Available)". In this row, the total number of lots available for each Lot Category was displayed under the respective Aggregate Demand column, in order to assist bidders in the calculations of excess demand.
- After the first round of mock auctions, the round prices for each of the Lot Categories in the Excel files was changed from a formatted integer to an unformatted decimal with 5-decimal precision, still stored as text.
- After the second round of mock auctions, numeric fields in the Excel files are formatted as a number rather than text. This includes all information provided for Round Prices and the Aggregate Demand for each Lot Category. Excess demand information is provided as a Yes/No text field.

Changes to the 'Bid history' download:

- Following the first round of mock auctions, information relating to Demand, Eligibility and Activity with Bids in Excel were updated to be formatted as

numbers. However, information relating to Round Prices and the Bid Amounts were displayed as a formatted string with five decimal places.

- Following the second round of mock auctions all information in the Excel files has been updated such that it is now formatted as a number. This includes all information provided for Round Prices, Demand, Eligibility, Eligibility associated with the Bid and the Bid Amount.

In addition, Bidders should note that after the first round of mock auctions, and following feedback, SUF information for each Lot Category has been removed from all tables and files.

3 Main frame - Wait for the Auction to start

Before the start of the Auction a message on your main frame will instruct you to *wait for the Auction to start*. Other information presented includes your initial eligibility as well as a summary of the available Lots, their respective eligibility and reserve prices.

Bidders are able to download the Reserve Price Summary table in the following format: CSV, Excel, XML.

These downloads have the following columns:

- Lot Category
- Eligibility Points per Lot
- Lots available
- Time Slice
- Aggregate Demand from Applications
- Excess Demand from Applications
- Reserve Price

In the Excel download, Eligibility Points per Lot, Lots available, Time Slice, Aggregate Demand for Applications and Reserve Price are presented as a number. The information provided in the 'Excess Demand from Applications' column is provided as a simple Yes or No.

For example files please see those named "Reserve Price Summary".

4 Main frame – Primary Bid Rounds

Note that no information is available for download from the main frame during any Primary Bid Round. Downloadable files are only available upon the

scheduling of a Primary Bid Round, and upon release of the results of a Primary Bid Round.

4.1 Schedule for Primary Bid Round 1

In addition to tables displaying Bidder Eligibility, Spectrum Caps and the number of Extensions available, upon scheduling the first primary Bid Round, the main frame will display a table with information regarding each of the Lot Categories the Bidder is able to Bid on.

This information is available to download from the moment at which the round is scheduled and until the start of that round.

Note, that relative to the Reserve Price Summary table, the Reserve price column is now shown after the 'Time Slice' column, and a new column is added to show the Round 'Prices for round 1'.

These downloads have the following columns:

- Lot Category
- Eligibility Points per Lot
- Lots available
- Time Slice
- Reserve Price
- Aggregate Demand from Applications
- Excess Demand from Applications
- Round Price in round 1

In the Excel download, all information is presented as a number, other than the information in the 'Excess Demand from Applications' column which is presented as a simple Yes or No.

For example files please see those named "Price Summary for round 1".

4.2 Results of Primary Bid Round 1

Once the Auctioneer has released the results of the first Primary Bid Round, Bidders will be able to download the results table in CSV, Excel and XML formats.

These downloads have the following columns:

- Lot Category
- Eligibility Points per Lot
- Lots available

- Time Slice
- Reserve Price
- Aggregate Demand from Applications
- Excess Demand from Applications
- Round Price in round 1
- Your demand in round 1
- Eligibility by Lot Category
- Expenditure by Lot Category
- Aggregate Demand in round 1
- Excess Demand in round 1

In the Excel download, all information is numeric other than the columns, "Excess Demand from Applications" and "Excess Demand in round 1".

For example files please see those named "Results of round 1".

4.3 Schedule for Primary Bid Round 2 onward

As in round 1, upon scheduling of the second Primary Bid Round (and all subsequent Primary Bid Rounds) the main frame will display a table with information regarding each of the Lot Categories the Bidder is able to Bid on.

This information is available to download from the moment at which the round is scheduled and until the start of that round.

However, the information displayed in this table differs slightly from that displayed in the first Primary Bid Round.

The downloads have the following columns:

- Lot Category
- Eligibility Points per Lot
- Lots available
- Time Slice
- Aggregate Demand in round 1
- Excess Demand in round 1
- Round Price in round 1
- Your demand in round 1

- Reserve Price
- Round Price in round 2

In the Excel download, all information is presented as a number, other than the information in the "Excess Demand in round 1" column which is presented as a simple Yes or No.

For example files please see those named "Price Summary for round 2."

Example files have also been included for the Price Summary for round 3 and 4.

4.4 Results of Primary Bid Round 2 onward

Once the Auctioneer has released the results of the previous Primary Bid Round, Bidders will be able to download the results table in CSV, Excel and XML formats.

These downloads have the following columns:

- Lot Category
- Eligibility Points per Lot
- Lots available
- Time Slice
- Reserve Price
- Round Price in round 2
- Your demand in round 2
- Eligibility by Lot Category
- Expenditure by Lot Category
- Aggregate Demand in round 2
- Excess Demand in round 2

In the Excel download, all information is numeric other than the columns "Excess Demand in round 2".

For example files please see those named "Results of round 2".

Example files showing the results from round 3 have also been included.

4.5 End of the Primary Bid Rounds

If there is no excess demand following the completion of the most recent Primary Bid Round, the main frame will display a message indicating the Primary Bid Rounds have ended and along with the round results.

For the avoidance of doubt and in line with the IM these results show details for all of the Lot Categories in the auction, including all Party-Specific Lots. This will also be reflected in the downloadable files.

These downloads have the following columns, where the final Primary Bid Round was is round 4 in our example:

- Lot Category
- Eligibility Points per Lot
- Lots available
- Time Slice
- Reserve Price
- Round Price in round 4
- Your demand in round 4
- Eligibility by Lot Category
- Expenditure by Lot Category
- Aggregate Demand in round 4
- Excess Demand in round 4

In the Excel download, all information is numeric other than the columns "Excess Demand in round 4".

For example files please see those named "Results of round 4".

This information can also be downloaded from the "Auction History" at any point once the results of the final Primary Bid Round have been announced.

5 Main frame – Supplementary Bids Round

5.1 Schedule for the Supplementary Bids Round

When the Supplementary Bids Round is scheduled, your main frame is automatically refreshed to display the message *Please wait for Supplementary Bids Round to start*, along with a summary of provisional Supplementary Bids.

The list of provisional Supplementary Bids is available for download in a number of formats, including CSV, Excel, XML and Bids file. The "Bids file" format that is the same format required for uploading a list of Supplementary Bids from a file into the Auction system.

Note that the information provided in the table, and all downloadable files is the same as that provided in the Supplementary Bids Editor once results from the final Primary Bid Round have been released.

The downloads will have the following columns:

- Package ID
- (1) 800/1
- (2) 800/2
- (3) 900/1
- (4) 900/2
- (5) 1800/1
- (6) 1800/2
- Time Slice 1 Eligibility Associated with Bid
- Time Slice 2 Eligibility Associated with Bid
- Package Reserve Price
- Highest bid Amount
- Relative Cap
- Constraining Package UID
- Final Price Cap
- Bid Amount

Note that columns for Lot Categories 7-10 will also be provided where relevant.

In the Excel download, all information is numeric other than where there is no cap. In this case, "Not capped" will appear in the relevant cell, and N/A in the cell associated with that package under the "Constraining Package UID" column heading.

For example files see those named "List of Provisional Supplementary Bids".

5.2 During the Supplementary Bids Round

When the Supplementary Bids Round begins, your main frame will be automatically refreshed to provide you with the necessary information and inputs for specifying and entering your Supplementary Bids.

Note that downloads available to bidders at this point are the same as were available during the round schedule. Information in these downloads will only differ where a bidder has made edits to its list of Provisional Supplementary Bids.

6 Main frame – Main Stage results

Main Stage Winning bids can be downloaded in CSV, Excel and XML format

The downloads will have the following columns:

- Bidder name
- 1) 800/1
- (2) 800/2
- (3) 900/1
- (4) 900/2
- (5) 1800/1
- (6) 1800/2
- (7) 900/1/MET
- (8) 1800/1/MET
- (9) 1800/1/TO2
- (10) 1800/1/VOD
- Bid Amount
- Base Price

In the Excel download, all information is numeric other than the Bidder name column, and any Bid Amount or Base Price information that does not relate to the Bidder – N/A will be displayed in these cells.

For example files see those named "Supplementary Bids Round – Summary of Winners and Winning Bids".

7 Main frame – Assignment Round

7.1 Schedule for the Assignment Round

Once the Assignment Round has been scheduled, Bidders can download their Assignment Options in CSV, Excel or XML format.

The downloads will have the following columns:

- Band
- Time Slice 1 frequency assignment
- Time Slice 2 frequency assignment

All these fields are text.

For example files see those named "Assignment options".

8 Main frame – Auction results

Once the Auctioneer has approved the results of the Assignment Round, Bidders have two sets of downloads available to them.

8.1 Summary of Auction Results

Bidders can download a summary of auction results in CSV, Excel and XML formats.

These downloads have the following columns:"

- Bidder name
- (1) 800/1
- (2) 800/2
- (3) 900/1
- (4) 900/2
- (5) 1800/1
- (6) 1800/2
- (7) 900/1/MET
- (8) 1800/1/MET
- (9) 1800/1/TO2
- (10) 1800/1/VOD
- Bid Amount
- Base Price
- Additional Price
- Total Price

In the Excel download, all information is numeric other than the Bidder name column, and any Bid Amount, Base Price, Additional Price or Total Price information that does not relate to the Bidder – N/A will be displayed in these cells.

For example files see those named "Supplementary of Auction results".

8.2 Results of Assignment Round

Once the results of the Assignment Round has been release, Bidders can download their results in CSV, Excel or XML format.

The downloads will have the following columns:

- Band
- Time Slice 1 frequency assignment
- Time Slice 2 frequency assignment
- Winning Bidder
- Bid Amount
- Additional Price

In the Excel download, all information is numeric other than the Band, frequency ranges, Winning Bidder and Additional Price that does not relate to the Bidder – N/A will be displayed in these cells.

For example files see those named "Lots Won".

9 Control panel

9.1 Supplementary Bids editor

The Information can be downloaded in the following formats: CSV, Excel, XML, Bids file

9.1.1 Prior to start of the Auction

This shows the Bidder's Application Bid which will have been allocated the unique Package ID of '0'. The information will be displayed with the following column headers:

- Package ID
- (1) 800/1
- (2) 800/2
- (3) 900/1
- (4) 900/2
- (5) 1800/1
- (6) 1800/2
- Time Slice 1 Eligibility associated with Bid
- Time Slice 2 Eligibility associated with Bid
- Package reserve Price
- Highest Bid Amount
- Provisional Cap

- Constraining Package UID
- Bid Amount
- Relaxed Primary Bid allowed

Note that columns for Lot Categories 7-10 will also be provided where relevant.

In the Excel download, all information is numeric other than where there is no cap. In this case, "Not capped" will appear in the relevant cell, and N/A in the cell associated with that package under the "Constraining Package UID" column heading. In addition, the "Relaxed Primary Bid Allowed" column will show either Yes or No.

For example files see those named "List of Provisional Supplementary Bids".

9.1.2 During the Primary Bid Rounds

During round 1 this will be the same as above.

This information and the format of downloads will remain consistent throughout the Primary Bid Rounds, with only new packages being added.

9.1.3 After the Primary Bid Rounds and prior to scheduling of the Supplementary Bids Round

Once the results of the Final Primary Bid Round have been announced the information in the Supplementary Bids editor and the associated downloads will be updated.

The downloads will have the following columns:

- Package ID
- (1) 800/1
- (2) 800/2
- (3) 900/1
- (4) 900/2
- (5) 1800/1
- (6) 1800/2
- Time Slice 1 Eligibility Associated with Bid
- Time Slice 2 Eligibility Associated with Bid
- Package Reserve Price
- Highest bid Amount
- Relative Cap

- Constraining Package UID
- Final Price Cap
- Bid Amount

Note that columns for Lot Categories 7-10 will also be provided where relevant.

In the Excel download, all information is numeric other than where there is no cap. In this case, "Not capped" will appear in the relevant cell, and N/A in the cell associated with that package under the "Constraining Package UID" column heading.

For example files see those named "List of Provisional Supplementary Bids end of PBRs".

9.2 Login history

This information is available to download in the following formats: CSV, Excel, XML.

The downloads contain the following columns:

- Action
- Time
- IP
- Browser

9.3 Auction History

This information is available to download in the following formats: CSV, Excel, XML.

The downloads contain the following columns:

- Round
- Round Price for (1) 800/1
- Aggregate Demand for (1) 800/1
- Round Price for (2) 800/2
- Aggregate Demand for (2) 800/2
- Round Price for (3) 900/1
- Aggregate Demand for (3) 900/1
- Round Price for (4) 900/2
- Aggregate Demand for (4) 900/2

- Round Price for (5) 1800/1
- Aggregate Demand for (5) 1800/1
- Round Price for (6) 1800/2
- Aggregate Demand for (6) 1800/2

Note that columns for Lot Categories 7-10 will also be provided where relevant.

All information provided is numeric.

9.3.1 Prior to the start of the Auction

This shows the number of Lots available, and details of the Bidder's Application Bid.

For example files see those files entitled, "Auction history up to round 0 of the Primary Bid Rounds".

9.3.2 During the Primary Bid Rounds

During the first Primary Bid Round, this will remain unchanged relative to the above phase.

Once results have been released from the previous Primary Bids Round, the information will be updated to include the relevant information from all completed Primary Bid Rounds.

For example files see those files entitles "Auction history up to round 1 of the Primary Bid Rounds", "Auction history up to round 2 of the Primary Bid Rounds", "Auction history up to round 3 of the Primary Bid Rounds".

9.3.3 End of the Primary Bid Rounds

Once results have been released from the Final Primary Bids Round, the information will be updated to include the relevant information from all completed Primary Bid Rounds.

For example files see those files entitles "Auction history up to round 4 of the Primary Bid Rounds".

In addition bidders will be able to download the results from the Final Primary Bid Round. See Section 4.5 above.

9.3.4 After the Main Stage

In addition to the Primary Bid Round Information and the results of the Final Primary Bid Round, once the Main Stage is complete, Bidders will also be able to download the Main Stage results from the Auction history Page – see Section 6 above for details on the Main Stage results.

9.3.5 End of the Auction

In addition to the Primary Bid Round Information, results of the Final Primary Bid Round, and results of the Main Stage, once the Assignment Round is complete, Bidders will also be able to download the Summary of Auction Results and Assignment Stage Results from the Auction history Page – see Section 8 above for details on the Auction results.

9.4 Bid History

This information is available to download in the following formats: CSV, Excel, XML.

The downloads contain the following columns:

- Round Price for (1) 800/1
- Round Price for (2) 800/2
- Round Price for (3) 900/1
- Round Price for (4) 900/2
- Round Price for (5) 1800/1
- Round Price for (6) 1800/2
- Demand for (1) 800/1
- Demand for (2) 800/2
- Demand for (3) 900/1
- Demand for (4) 900/2
- Demand for (5) 1800/1
- Demand for (6) 1800/2
- E1
- E2
- EB1
- EB2
- Amount

Note that columns for Lot Categories 7-10 will also be provided where relevant. All information provided is numeric.

9.4.1 Prior to the start of the Auction

Provides details of the Bidder's Application Bid.

For example files see those entitled "Bid History up to round 0 of the Primary Bid Rounds".

9.4.2 During the Primary Bid Rounds

During the first Primary Bid Round, this will remain unchanged relative to the above phase.

Once results have been released from the previous Primary Bids Round, the information will be updated to include the relevant information from all completed Primary Bid Rounds.

For example files see those entitled "Bid History up to round 1 of the Primary Bid Rounds", "Bid History up to round 2 of the Primary Bid Rounds", "Bid History up to round 3 of the Primary Bid Rounds".

9.4.3 End of the Primary Bid Rounds

Once results have been released from the Final Primary Bids Round, the information will be updated to include the relevant information from all completed Primary Bid Rounds.

For example files see those files entitled "Bid history up to round 4 of the Primary Bid Rounds".

9.4.4 After the Main Stage

In addition to the Primary Bid Round Information and the results of the Final Primary Bid Round, once the Main Stage is complete, Bidders will also be able to download a table showing their Supplementary Bids.

The downloads contain the following columns:

- Demand for (1) 800/1
- Demand for (2) 800/2
- Demand for (3) 900/1
- Demand for (4) 900/2
- Demand for (5) 1800/1
- Demand for (6) 1800/2
- Amount

Note that columns for Lot Categories 7-10 will also be provided where relevant.

All information provided is numeric.

For example files see those entitled "Bid History up to the end of the Supplementary Bids Round".

9.4.5 End of the Auction

Following the completion of the Assignment Round, Bidders will be able to download a list of Bids they submitted during the Assignment Round.

The downloads will have the following columns:

- Band
- Time Slice 1 frequency assignment
- Time Slice 2 frequency assignment
- Amount of your Bid

For example files see those named "Summary of Assignment Round results".

132. ComReg: to All Bidders “Dot econ Report: Eligibility-reducing relaxed primary bids in ComReg’s multiband auction” (Report dated 20 September 2012)

Eligibility-reducing relaxed primary bids in ComReg's multiband auction

A report for ComReg

20 September

1 Summary

1. This report considers one aspect of the activity rules in ComReg's multiband auction relating to the operation of the relative caps in specific circumstances.
2. As this report is intended only for Qualified Bidders, it assumes that the reader is familiar with auction rules, as set out in ComReg's Information Memorandum (ComReg document 12/52) ("**the IM**").
3. The combination of two categories of eligibility (time slices 1 and 2) with the rules for relaxed primary bids creates the possibility of an *eligibility-reducing relaxed primary bid*. This occurs where a bidder bids in excess of its current eligibility in one time slice, but strictly below its eligibility in the other.
4. As currently formulated, the detailed rules for the relative cap as described in the IM do not deal appropriately with relative caps imposed following an eligibility-reducing relaxed primary bid, permitting a "disconnection" in the chain of relative caps if subsequent reductions in eligibility occur.
5. Specifically, an eligibility-reducing relaxed primary bid is subject to a relative cap from a bid made earlier in the primary bid rounds. The auction rules provide for a package to be subject to at most one relative cap, so this necessarily means that a package subject to an eligibility-reducing relaxed primary bid (and indeed other packages subject to preceding eligibility-reducing primary bids) cannot be capped by any primary bids made in subsequent primary bid rounds.
6. As a result, this creates a disconnection in the chain of relative caps following an eligibility-reducing relaxed primary bid. Such a disconnection in the chain of relative caps would mean that, in these limited circumstances, the detailed auction rules would not implement the express intention set out at a high level in paragraph 4.156 of the IM:

"The rule above [i.e. the relative cap rule] has the effect of creating a chain of constraints that cap the Supplementary Bid for any package of Lots X relative to the last Bid made for a package of Lots not exceeding the Bidder's Eligibility in the final Primary Round."

7. Whilst all bids will be subject to the final price cap, this is not a substitute for the chain of relative caps intended in the IM. The final price cap could be much more permissive than a relative cap, as the final price cap limits bid differentials according to the final clock prices, whereas a relative cap uses the prices that applied when a bidder was last able to bid for the package in question.
8. Therefore, whilst this disconnection of relative caps can only occur in very specific circumstances and its likely impact on bidding behaviour is limited, we cannot rule out the possibility that it could affect auction outcomes in certain cases. For this reason, we set out, in this report, how the omission can be easily rectified without changing any key features of the auction rules though a minor amendment of the definition of a Constraining Round (which is a term used within the definition of the Relative Cap in Annex 1 of the IM). We recommend that ComReg make this small modification and have set out in Annex B proposed amendments to the IM to implement this.
9. As noted in paragraph 4.41 of the IM, relaxed primary bids are entirely optional and bidders are not obliged to use such bids. This position also applies to eligibility reducing relaxed primary bids.
10. The proposed amendment is only relevant in the case that a bidder makes an eligibility-reducing relaxed primary bid and then subsequently reduces eligibility again. All other aspects of the rules are entirely unaffected by this change (including the final price cap and rules for determining eligibility). In the interests of ensuring complete transparency around both the issue identified and the recommended amendment of the rules, this report sets out a number of detailed examples showing how the structure of the relative caps develop over the course of the primary bid rounds.
11. This report is structured as follows:
 - Section 2 provides a detailed analysis of the structure of relative caps;
 - Section 3 sets out proposed modifications to the Activity Rules. We recommend that ComReg makes this change to the Auction Rules by adopting the amendments to the IM recommended in Annex B;
 - Annex A provides an proof of the possibility of making a relaxed bid given a loop of relative caps;
 - Annex B contains proposed amendments to Chapter 4 and Annex 1 of the IM aimed at implementing the modifications proposed in Section 3. We recommend that ComReg implements these amendments to the IM; and
 - Annex C provides an amended version of Annex 7 of the IM. The calculations underlying the examples in Annex 7 of the IM remain essentially unchanged by the proposed amendments presented in Annex B. As such, the amendments to Annex 7 are not strictly necessary. However, they provide a useful illustration of how the Constraining Round re-set rule would apply. We therefore recommend that ComReg implements these changes to the IM.

2 The structure of relative caps

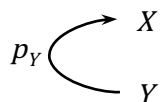
12. In this section, we provide a detailed analysis of the structure of relative caps.

2.1 Arrow notation

13. The features of relative caps can be helpfully visualised by adopting the following “arrow” representation.
14. Consider the case where a bidder first bids for a package X at price p_X and then, in the subsequent round drops eligibility to bid for a package Y at price p_Y . This means that any subsequent bid $\beta(X)$ for package X is subject to a cap relative to the bid $\beta(Y)$ for package Y , with the difference in bid amounts determined by the difference in the lots between the two packages, evaluated at the prices in the constraining round, i.e.

$$\beta(X) \leq \beta(Y) + (X - Y) \cdot p_Y$$

We represent this diagrammatically as



The sequence of rounds runs down the page (i.e. we first bid for X then for Y).

15. Here the arrow runs from a package to a package it constrains. Therefore, to move from the package X to its corresponding constraining package Y , we need to move backwards along the arrow.
16. The arrow is associated with a price differential, i.e. $(X - Y) \cdot p_Y$. This is the quantity change moving from the constraining package Y to the constrained package X valued at the prices p_Y that were in force when the constraining package was chosen. We can label the arrow with p_Y to emphasise that the quantity difference is valued at p_Y (which is in any case implicit without the label, as these are the round prices applying in the “source” round).
17. Key points to note are that:
- the link has a direction, running from a constraining package to a constrained package;
 - because each package has at most one constraining package, it follows that the package chosen in any round has at most one incoming arrow arriving at that package;
 - however, note that a single package may (and typically will) constrain more than one package, and therefore there may be many outgoing arrows from a package.
18. To indicate different types of bids made in the diagrams that follow:
- Let S denote a standard primary bid (i.e. not a relaxed primary bid) where eligibility is maintained going forward;
 - Let S_- denote a standard primary bid where eligibility is strictly reduced going forward for at least one time slice (and not increased in either time slice as this is not a relaxed primary bid);

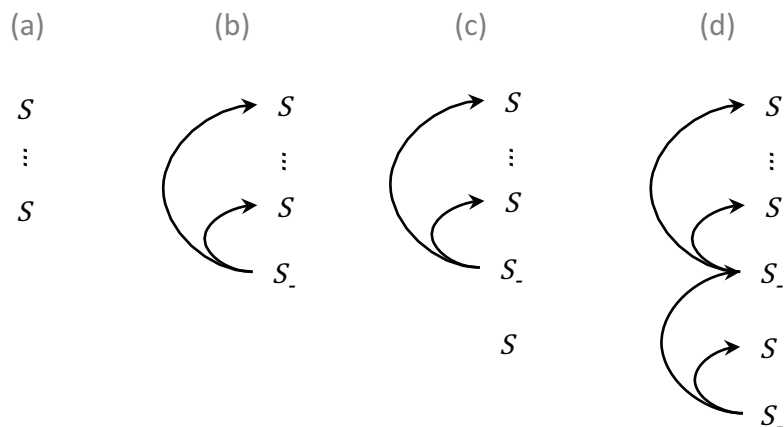
- Let R denote a relaxed primary bid in which eligibility is maintained going forward round (i.e. bidding activity meets or exceeds eligibility in both time slices and strictly exceeds it in at least one); and
- Let R_- denote a relaxed primary bid in which eligibility is strictly reduced going forward (i.e. bidding activity strictly exceeds eligibility in one time slice, whereas activity is below the bidder's eligibility in the other time slice).

	Eligibility-maintaining	Eligibility-reducing
Standard primary bid	S	S_-
Relaxed primary bid	R	R_-

19. The four categories are summarised in the table above. In these diagrams, we are largely concerned with the type of bid made in each round (i.e. which of the four categories above occurs) rather than the exact composition of the package bid for each in round.

2.2 A simple example

20. We start with a very simple example in which eligibility is reduced in steps and there are no relaxed primary bids. The diagram below shows how the relative caps build up over successive rounds as eligibility is dropped.

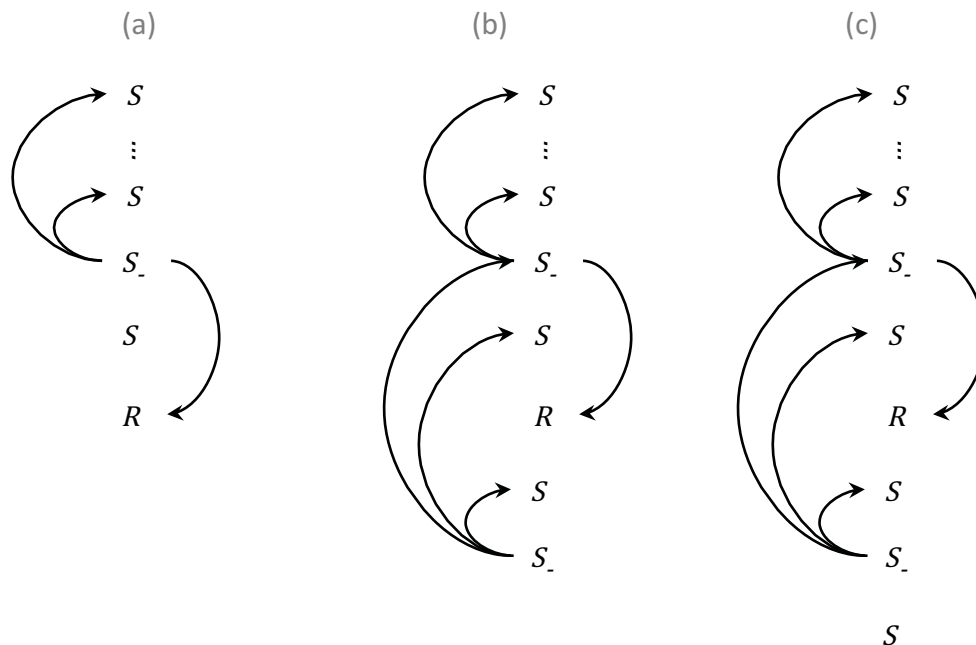


- a) The bidder starts by making a number of standard primary bids without dropping eligibility, shown as a sequence of S 's in case (a). At first, no relative caps are in force, as the bidder is maintaining its initial eligibility.
- b) The bidder reduces eligibility for the first time (shown as a bid labelled S_-). This reduction in eligibility establishes relative caps on all packages bid for in the previous rounds.

- c) Suppose that the bidder then makes a further standard primary bid without reducing eligibility; a further S added. This package is uncapped at this point.
- d) On the next reduction of eligibility, which occurs in the next round, a relative cap is established on each previous package not already having a cap, including the package subject to the previous eligibility-reducing bid (i.e. the previous S_-).
21. A key feature in this example is that the relative caps are chained from one eligibility-reducing bid to the next. There are arrows connecting each S_- back to the previous one in the diagram above.

2.3 Relaxed primary bids

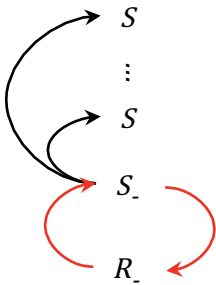
22. Now add relaxed primary bids to these diagrams. In this subsection, we consider only the case of relaxed primary bids that do not reduce eligibility. Eligibility-reducing relaxed primary bids will be considered in Section 2.4 following.
23. Any package X subject to a relaxed primary bid could have been subject to a standard (non-relaxed) primary bid in some previous constraining round where the bidder had sufficient eligibility to bid for X . A relative cap is established on X by the constraining package Y that was the subject to the primary bid in that constraining round. By definition, Y must have been bid for in some round in which the bidder reduced eligibility, otherwise this would not be the last occasion on which it was possible to bid for X .
24. This is shown in the following example.



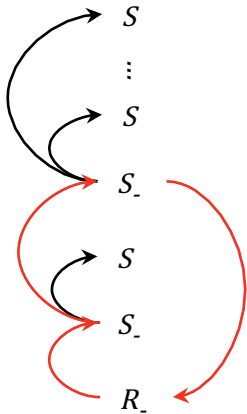
- a) R denotes the round subject to a relaxed primary bid (i.e. for package X). In this example, the bidder has only made one reduction in eligibility; therefore, the constraining package Y is that bid for in the only round eligibility was dropped (shown as the one S_- shown in case (a)). The arrow runs from S_- to R , as the relative cap applies to the package (R) subject to the relaxed primary bid, and the constraining package is the previous eligibility-reducing primary bid (S_-).
 - b) The bidder makes a further standard primary bid after the relaxed primary bid, and then a further eligibility-reducing standard primary bid (i.e. the lowest S_- shown in case (b)). This imposes relative caps on all previous uncapped packages up to and including the preceding S_- bid.
 - c) Notice that we obtain an unbroken chain of relative caps linking the S_- eligibility-reducing standard primary bids. The package subject to the relaxed primary bid R is then capped by a constraining package subject to one of its eligibility-reducing standard primary bids (S_-). This constraining package is whichever package the bidder bid for when it was last eligible to bid for R .
25. This unbroken chain of relative caps arises because each constraining package in turn has a constraining package that is strictly smaller in at least one time slice and not greater in the other time slice. This example allows all the constraining packages to be naturally ranked in relation to their size (in terms of eligibility). Further eligibility reductions will then append to the chain of constraining packages, forming a chain of constraining packages ultimately anchored to the smallest constraining package.

2.4 Eligibility-reducing relaxed primary bids

26. We now consider the case where a bidder submits an eligibility-reducing relaxed primary bid. This is a more complex situation and always creates a loop of relative caps. This is because:
- a) the package subject to the eligibility-reducing relaxed primary bid is *subject to* a relative cap, as it is a *relaxed* primary bid; and
 - b) the submission of this bid also *creates* a relative cap on the package subject to a previous eligibility-reducing (standard or relaxed) primary bid, as a consequence of this further reduction in eligibility.
27. A simple example of an eligibility-reducing relaxed primary bid is shown below. Here the bidder first makes a number of standard primary bids and maintains its initial eligibility (shown as the initial S 's). It then makes a standard primary bid, but drops eligibility (the S_-). This drop in eligibility creates relative caps on the packages subject to previous bids, as in our previous examples.

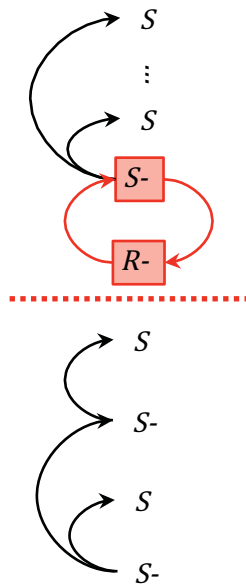


- 28. In the next round, the bidder then makes a relaxed primary bid that reduces eligibility (shown as R_-). As this is a relaxed primary bid, it is subject to a relative cap, with the constraining package being the subject of the primary bid submitted in the last round (as the bidder had sufficient eligibility in that round to bid for the package that is now the subject of R_- as a standard bid). This must be a previous eligibility-reducing round (shown as S_-). This gives rise to the downward arrow (from S_- to R_-).
- 29. As this is an eligibility-reducing round, the primary bid for R_- also creates relative caps (directly or through a chain of caps) on all previous uncapped packages. This creates the upward arrow from R_- to S_- . Therefore, there is a loop of constraints created between R_- and S_- .
- 30. In general, any eligibility-reducing relaxed primary bid will create a loop, but it may involve multiple “steps” depending on how many eligibility reductions there have been since the bidder first bid for the constraining package. The example below illustrates a case in which the constraining package is two steps back in the sequence of eligibility reductions. The loop is shown in red.



2.5 Bids following an eligibility-reducing relaxed primary bid

- 31. What happens after an eligibility-reducing relaxed primary bid? The example below shows a bidder making a number of standard primary bids following an eligibility-reducing relaxed primary bid (shown as R_-).



32. We show two subsequent drops in eligibility after the R_- bid. Consider the first eligibility-maintaining standard primary bid (i.e. S) following the R_- bid. As there is no reduction in eligibility, no relative cap is created yet.
33. In the next round, the bidder reduces eligibility (i.e. it submits an S_- bid). This creates a relative cap on all packages that the bidder had eligibility to bid for in this round. However, the bidder did not have eligibility to bid for the R_- package¹ (which was thus already subject to a relative cap), nor for any other package on which it made a bid prior to having made the R_- bid. This creates a disconnection in the relative caps, as bids for the smaller packages below the red dashed line do not constrain those above the line.
34. This disconnection always happens immediately after an eligibility-reducing relaxed primary bid. This can be seen by considering the arrow coming into the R_- bid, representing its relative cap. It is necessarily an arrow from above; because this is a relaxed primary bid it is constrained by some package already bid for in a previous eligibility-reducing round. Because each package receives at most one incoming arrow (i.e. has at most one constraining package), it follows that the R_- bid cannot be constrained by subsequent bids.
35. This disconnection is clearly contrary to the express intention of the auction rules. At §4.156, the IM talks about the effect of the relative cap rule:

“The rule above [i.e. the relative cap] has the effect of creating a chain of constraints that cap the Supplementary Bid for any package of Lots X relative to the last Bid made for a package of Lots not exceeding the Bidder’s Eligibility in the final Primary Round.”

¹ By definition, as the R_- bid was a relaxed bid it was in excess of the bidder’s eligibility in one time slice.

² Strictly speaking, a chain bid occurs where this minimum bid level is below the current round price, but

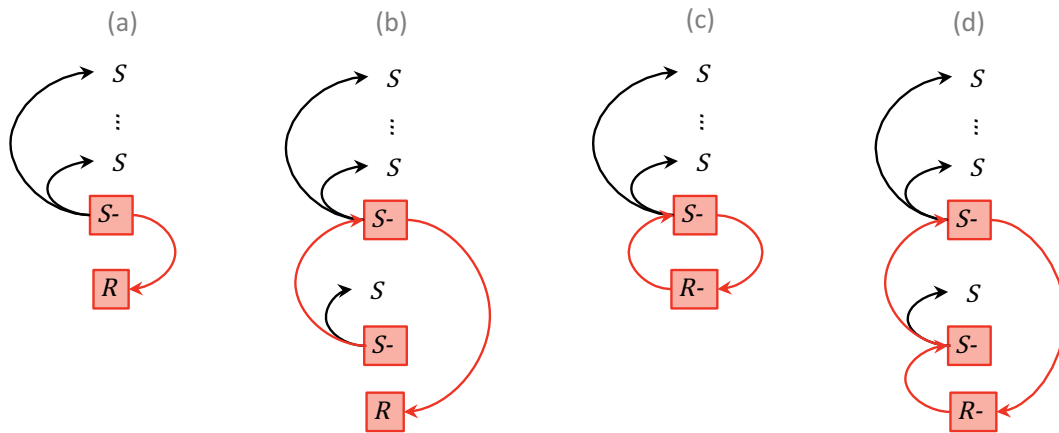
36. Clearly all these packages will eventually become subject to the final price cap, so it is not the case that the bid amounts can be increased with impunity. However, there could be many primary bid rounds and prices could rise significantly before the final primary round. In this case, the final price caps may be much more permissive than relative caps, as differentials between packages could be determined at much higher prices.
37. Given this, the concern is that bidders might seek to engineer a situation in which this disconnection occurs in order to create more permissive caps on the bids they may submit in the supplementary bids round. Typically it is difficult to achieve such an effect with any certainty. Nevertheless, there are scenarios in which this may be possible.
38. One case of concern is where there is little excess demand and the primary bid rounds are close to ending. In this case, if a bidder reduces demand in one lot category, this could lead to no excess demand in that category in the subsequent primary round and the price of that category freezing. Nevertheless, the prices of lot categories in the other time slice might continue to rise. In such a case, the bidder can expect to be able to make a relaxed primary bid in a later round. If this is then an eligibility-reducing relaxed primary bid, the disconnection of relative caps discussed above will occur.
39. For these reasons, we recommend that a small modification of the rules for relative caps be made to address this situation and reconnect the relative caps where they would otherwise be unlinked following an eligibility-reducing relaxed primary bid. In order to understand how this modification works, we first need to explore the consequences of there being a "loop" of relative caps in a little more detail.

2.6 Permissibility of relaxed primary bids

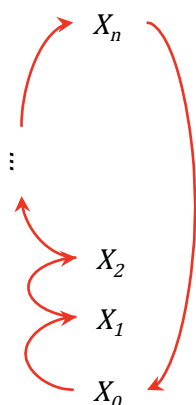
40. Relaxed primary bids are only possible in situations where these are consistent with the relative caps that result from previously made bids. In particular, in order to be able to make a relaxed primary bid, it is necessary that the consequential chain bids² do not exceed the current round prices (see §4.86 and following of the IM).
41. The packages potentially subject to chain bids are easily identifiable in these arrow diagrams. They are identified by following the arrows *backwards* from the relaxed primary bid until a package is reached that the bidder is currently eligible to bid for. The first step backwards identifies the constraining package of the package subject to the relaxed primary bid. The second step backwards identifies the constraining package of the first constraining package and so on.
42. Consider first cases (a) and (b) in the illustration below. These are examples in which a relaxed primary bid does not reduce eligibility. The relaxed primary bid is at current round prices. The relative cap on the relaxed primary bid

² Strictly speaking, a chain bid occurs where this minimum bid level is below the current round price, but above the highest bid made so far for that package. In this case, a chain bid is required to increase this to this minimum bid level.

requires a minimum bid level for the bid for its constraining package. In turn, there is a required minimum bid level on the bid for that package's constraining package and so on. These are the chain bids, which are found by backtracking along the arrows (shown in red). None of these implied chain bids may exceed the price of that package in the current round for the relaxed primary bid to be possible.



43. Consider now cases (c) and (d). These are similar to cases (a) and (b), except now the relaxed primary bid is assumed to be eligibility-reducing. In these examples, the package subject to the preceding eligibility-reducing primary bid, which was uncapped prior to the submission of the eligibility-reducing relaxed primary bid, becomes subject to a relative cap once the relaxed primary bid is made. The result is the loop of relative caps shown in red.
44. We can still apply the same procedure following arrows backwards from the relaxed primary bid, but when this is also an eligibility-reducing bid, we will eventually return back to the package subject to the relaxed primary bid from which we initially started. In order for the relaxed primary bid to be possible, we need:
- the loop of relative caps to be mutually compatible; and
 - the minimum bid levels (which would apply to any necessary chain bids) not to exceed the current round prices for each constraining package traversed.
45. A general example of the loop of relative caps that results from the submission of an eligibility-reducing relaxed primary bid is shown below, where X_0 is the package subject to the eligibility-reducing relaxed primary bid. X_n is the constraining package of X_0 . Then X_r has a constraining package X_{r-1} for $r = 1, \dots, n$.



46. In order to make this relaxed primary bid, the relative caps will need to be mutually consistent. This has a simple geometric interpretation. Each arrow has an associated "length", which is the price difference in lots between the constrained package and the constraining package valued at the prices applying in the constraining round (see paragraph 14 above).
47. A necessary condition for the loop of relative caps to be consistent is that:
- The price difference associated with the relative cap that results from the submission of X_0 (i.e. the new "arrow" from X_0 to X_1) cannot exceed the sum of price differences associated with the relative caps that link X_0 back to X_1 (implied by the "arrows" that go from X_1 to X_n and ultimately to X_0).³*
48. Consider first the sum of price differences associated with the arrows linking X_0 to X_1 (anticlockwise). If X_0 receives a bid at the current round prices, then the relative cap imposed by X_n on X_0 implies a minimum bid level needed for X_n . This minimum is the bid for X_0 plus the price difference represented by the *down* arrow from X_n . Then, a bid for X_n requires a minimum bid level for X_{n-1} (an *up* arrow); a bid for X_{n-1} requires a minimum bid level for X_{n-2} (an *up* arrow) and so on. Eventually, having travelled completely around the loop, we find an implied minimum bid level for X_1 . Therefore, the sum of these price differences represent the maximum price difference between X_0 and X_1 that is consistent with these relative caps.
49. Consider now the price difference represented by the arrow going from X_0 to X_1 . This price difference is the difference between X_0 and X_1 at current round prices. However, if the price difference between X_0 and X_1 at current round prices was greater than the maximum price difference between X_0 and X_1 that is consistent with these relative caps, then a relaxed primary bid for X_0 would not have been possible.
50. Note also that we can generalise this condition as follows:

³ Note that differentials may be positive or negative.

The price difference associated with a relative cap that is chained within a loop of relative caps cannot exceed the sum of price differences associated with all other relative caps within the loop.⁴

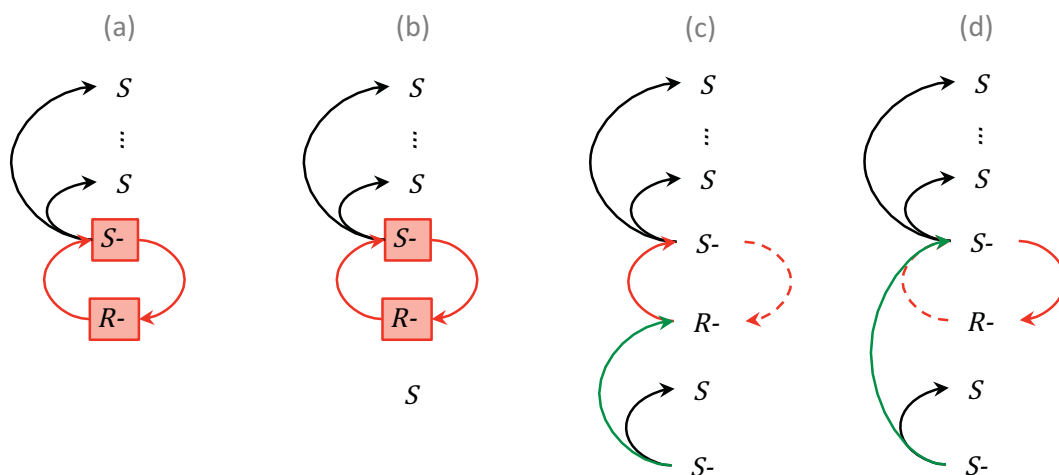
51. In other words, the price difference associated with any one arrow within a loop cannot exceed the sum of price differences associated with all other arrows within the loop. This is because otherwise the relative caps would not be mutually consistent.

2.7 Consequences of looped relative caps

52. As we have demonstrated above, whenever an eligibility-reducing relaxed primary bid is made, a loop of relative caps will result. Starting from the package bid for, if we find its constraining package, then that package's constraining package and so on, we will always eventually loop back to the original package that is subject to the relaxed primary bid. Therefore, a loop of constraints always results. Moreover, for any permissible relaxed primary bid, the differentials associated with these relative caps must be consistent when traversing the loop.
53. As a result of this loop of constraints, it follows as a direct logical consequence that in any subsequent round it will be possible to make a relaxed primary bid for at least one of the packages within this loop. This is true for every subsequent round as long as the loop is maintained. Which specific package within the loop could be the subject of a relaxed primary bid may depend on the round prices, and in some cases, a relaxed primary bid may be possible for more than one of the packages in the loop. However, it will always be possible to bid for at least one package in the loop.
54. Therefore, in the loop shown above, in any round subsequent to the eligibility-reducing relaxed primary bid for X_0 , it will *always* be possible to make a relaxed primary bid for at least one of the packages X_0, X_1, \dots, X_n . An elementary proof of this is provided in Annex A.
55. A direct consequence of this property is that, following an eligibility-reducing relaxed primary bid for a package X_0 , in the first subsequent round in which eligibility is reduced further by making a primary bid for some package Y , a relaxed primary bid could have been made on at least one of the packages X_0, X_1, \dots, X_n within the loop of relative caps.
56. Specifically, let us suppose that the bidder could have bid for X_j . As the bidder has chosen Y in preference to X_j in an eligibility-reducing round, we can impose a relative cap on X_j with Y as the constraining package to reflect this preference. Notice that the only difference between this approach and the activity rules included in the IM is that we are taking into account the fact that a relaxed primary bid for at least one of the packages X_0, X_1, \dots, X_n would have been possible as a result of the existence of a loop of relative caps.

⁴ Again note that differentials may be positive or negative.

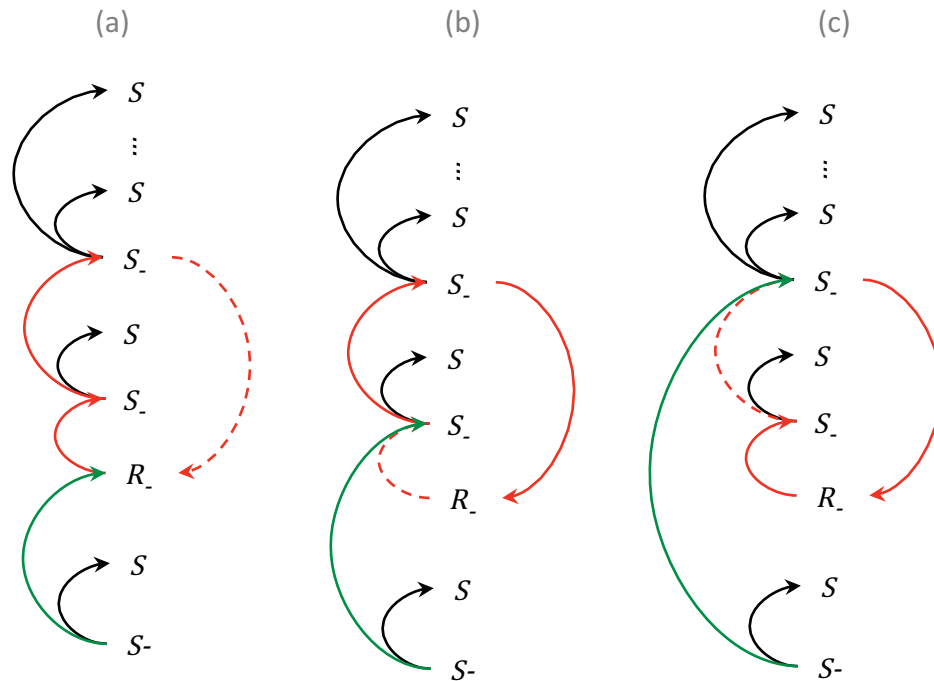
57. The only remaining issue is that the package X_j will already be subject to a relative cap. This must be so as, by definition, it is a member of a loop of relative caps. However, if X_j is then subject to a relative cap from Y , then the package X_j would be subject to two relative caps. This is an undesirable feature as it would place unnecessary constraints on the bidder. Also, if further eligibility-reducing relaxed primary bids were made that resulted in a loop that again included X_j , it would be possible that X_j could end up having even more than two relative caps, creating significant complexity.
58. To avoid this problem, the existing relative cap on X_j can simply be replaced by the new relative cap against Y , as we now show. This amounts to re-setting the constraining package (and constraining round) for X_j .
59. An example is provided in the illustration below. Case (a) shows the situation directly after the bidder has made an eligibility-reducing relaxed primary bid (R_-). A loop of relative caps is created (shaded red), which means that in any subsequent round it will always be possible to make a relaxed primary bid for at least one package in the loop.



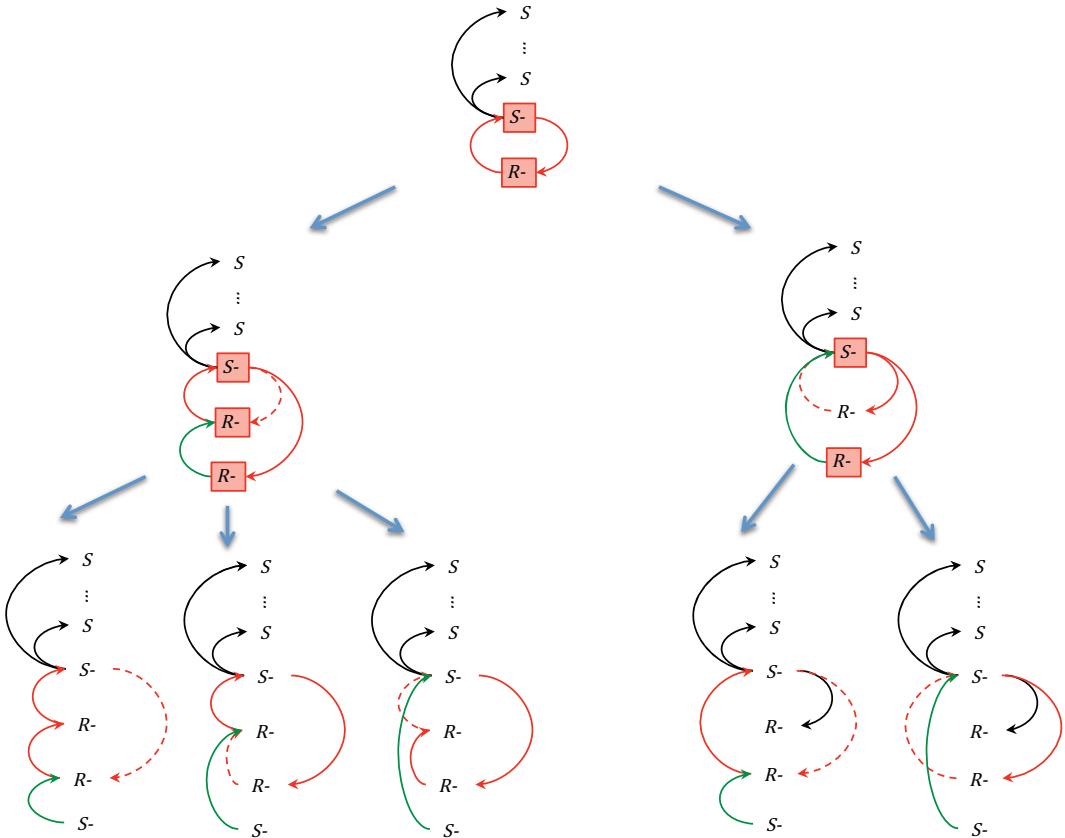
60. The bidder then makes a standard primary bid that does not reduce eligibility, shown as case (b). As there has been no reduction in eligibility, no new relative caps are introduced. The package subject to the last primary bid remains uncapped until such time as there is a subsequent reduction in eligibility. The loop of relative caps involving R_- remains for now.
61. Now suppose that the bidder drops eligibility (by submitting an S_- bid). We know that the bidder is also able to make a relaxed primary bid in this round for at least one of the two packages within the loop of relative caps.
62. In case (c), let us suppose that the bidder would be able to submit a relaxed primary bid for the most recent primary bid in the loop (i.e. the R_- package). We impose a new relative cap (the green arrow) and remove the previous relative cap (shown as a red dashed arrow).
63. Conversely, if the bidder cannot bid for R_- package, it will be able to make a relaxed primary bid for the other package in the loop (a S_- package). This is

shown as case (d). Notice that in both cases (c) and (d) the loop of relative caps is eliminated.

64. In the diagram below, we illustrate the same approach at work in a slightly more complex example in which there are three packages in a loop of relative caps. Once this loop is established, we know that it will always be possible to make a relaxed primary bid for at least one of the three packages in the loop; however, we do not know in advance which one, as this will depend on round prices.



65. As any of the three packages within the loop might be subject to a relaxed primary bid in the final round, we show three cases. The green arrow shows the new relative cap. A relative cap is then dropped (dashed red arrow) such that each package receives just one incoming arrow.
66. In the event that there is more than one package within the loop of relative caps that admits a relaxed primary bid, the new relative cap should be imposed against the most recently made bid. This permits maximum flexibility for revision of valuations (e.g. due to common value uncertainty) within the constraints of the relative caps. Therefore, in the example above, if it were possible to make a relaxed primary bid on more than one of the packages in the loop, then case a) would be chosen in preference to case b), which would be chosen in preference to case c). This establishes a relative cap for the package most recently added to the loop that a bidder could have bid for in the current round.
67. So far, we have shown a standard eligibility-reducing bid following the establishment of a loop of constraints, which then causes this loop to be cut and re-joined through a new relative cap. However, what if the next reduction of eligibility occurs through a relaxed primary bid? This situation is shown in the example below.



- 68. We start with a loop of two relative caps. This is followed by an eligibility-reducing relaxed primary bid. This causes the previous loop of constraints to be cut, but a new constraint is then established. There are two cases to consider, depending on whether the new R_- bid is capped by the previous R_- bid, establishing a new loop of three relative caps, or capped by the previous S_- bid, resulting in a new loop of two relative caps.
- 69. Whichever of these two cases occurs, suppose that now the bidder makes a standard eligibility-reducing primary bid, shown as the final S_- in the lowest tier of diagrams above. This will then cut the existing loop of constraints, depending on which preceding package establishes the relative cap. Therefore, in all cases we end up with all packages being part of a chain of relative caps and there being no loops.

3 Proposed amendment to the Activity Rules

70. After a bidder submits an eligibility-reducing primary bid, it may be necessary to update the relative cap on one of the constraining packages for that bidder⁵ in order to preserve the chain of relative caps. This will be the case when the bidder previously reduced eligibility through a relaxed primary bid, as otherwise the chain of relative caps would be broken. The update becomes necessary on the first occasion where the bidder submits an eligibility-reducing primary bid following the submission of an eligibility-reducing *relaxed* primary bid.
71. As discussed above, whenever a loop of relative caps (created by the submission of an eligibility-reducing relaxed primary bid) is in place, the bidder will always be able to submit a relaxed primary bid for at least one of the constraining packages in the loop. This will also be true for the round in which the bidder submits a further eligibility-reducing primary bid (if any further reductions in eligibility take place). Therefore, it is appropriate to impose a revealed preference constraint on the package that could have been subject to a relaxed, non-eligibility-reducing primary bid instead of the eligibility-reducing primary bid that the bidder chose.
72. In order to preserve the simplicity of having a single relative cap for each package, this revealed preference constraint is not imposed as an additional relative cap on the package, but replaces the previous relative cap on the package. This adjustment is sufficient to re-establish the chain of relative caps between constraints that arise from previous and subsequent eligibility-reducing primary bids.
73. Note that in order to re-establish the chain of relative caps, only one such link is necessary. Therefore, where the bidder may have been able to submit a relaxed primary bid for more than one of the constraining packages involved in the loop of relative caps, the new relative cap will be applied to only one of these packages. In particular, and with the aim of providing maximum flexibility for updating valuations during the open stage, the relative cap will be applied to the most recent of these packages.
74. Notice that this modification of the relative cap amounts to simply redefining the constraining package (and constraining round) whenever a new relative cap is established in place of some existing relative cap within a loop of constraints.

⁵ i.e. for one of the packages for which the bidder has previously submitted an eligibility-reducing (relaxed or standard) primary bid.

Constraining round re-set rule for package X

The Constraining Round for package X may subsequently be re-set in the course of the Primary Bids Rounds in certain circumstances after the Bidder has made an eligibility-reducing Relaxed Primary Bid. Specifically, the Constraining Round for package X would be re-set at the end of a Primary Bid Round R **if**:

- i) The Bidder submitted an eligibility-reducing Primary Bid in Round R for package Y;
- ii) The most recent eligibility-reducing Primary Bid made by the Bidder prior to Round R was a Relaxed Primary Bid;
- iii) Package X was subject to an eligibility-reducing Primary Bid in some Round S prior to Round R;
- iv) The Bidder was able to make a Primary Bid for package X in Round R; and
- v) There was no other package that was subject to an eligibility-reducing Primary Bid prior to Round R and subsequent to Round S for which the bidder could have submitted a Primary Bid in Round R

then the Constraining Round for package X will be set to Round R (and so the Constraining Package for package X will become package Y).

- 75. This adjustment ensures that the relative caps remain linked in a chain ultimately anchored on the bid that the bidder submits for the package it bid for when it last reduced eligibility. Also, by re-setting the constraining package, this automatically removes the preceding relative cap and ensures that each package is subject to at most one relative cap.
- 76. Notice that this change only affects the relative caps in these specific circumstances. There is no change to the operation of the relative cap if a bidder does not make any eligibility-reducing relaxed primary bids, or if the bidder makes an eligibility-reducing relaxed primary bid but does not then reduce eligibility further. There is no impact on the final price cap under any circumstances.
- 77. We recommend that ComReg makes this change to the Auction Rules by adopting the amendments to the IM recommended in Annexes B below.

Annex A Proof of possibility of a relaxed bid given a loop of relative caps

78. Suppose that a loop of relative caps has become established amongst the packages X_0, X_1, \dots, X_n . The constraining package of X_r is X_{r-1} for $r = 1, \dots, n$ and the prices in the constraining round p_{r-1} . The constraining package of X_0 is X_n and the prices in the constraining round p_n . (The loop is that illustrated in the diagram at paragraph 45.)

79. Let X_0 be the package within the loop that was subject to the most recent eligibility-reducing relaxed primary bid. Such a bid must exist within the loop, otherwise the loop of constraints would not have formed.

80. The relative caps in force amongst X_0, X_1, \dots, X_n are then:

$$\beta(X_1) \leq \beta(X_0) + p_0 \cdot (X_1 - X_0)$$

$$\beta(X_2) \leq \beta(X_1) + p_1 \cdot (X_2 - X_1)$$

⋮

$$\beta(X_n) \leq \beta(X_n) + p_{n-1} \cdot (X_n - X_{n-1})$$

$$\beta(X_0) \leq \beta(X_n) + p_n \cdot (X_0 - X_n)$$

where $\beta(X_i)$ is the highest bid so far for X_i .

81. These constraints are mutually compatible. In particular, as a relaxed primary bid for X_0 was possible at prices p_0 , the relative caps admit a solution where

$$\beta(X_0) = p_0 \cdot X_0 \text{ and } \beta(X_r) = p_0 \cdot X_0 + d_i \text{ for } i = 1, \dots, n$$

for some differences d_1, \dots, d_n with the solution satisfying $\beta(X_i) \leq p_0 \cdot X_i$ (i.e. none of the chain bids exceed the price of the packages at prices p_0 in force when the bid for X_0 is made).

82. Now consider the possibility of a relaxed primary bid in some subsequent round where the round prices $p \geq p_0$.

83. As the relative caps only constrain *differences* between packages, for any choice of b the bids defined by

$$\beta(X_0) = b \text{ and } \beta(X_r) = b + d_i \text{ for } i = 1, \dots, n$$

must satisfy the relative caps. On setting $b = p_0 \cdot X_0$, we know already from above that $\beta(X_i) \leq p_0 \cdot X_i \leq p \cdot X_i$.

84. Now increase b until one of the constraints $\beta(X_i) \leq p \cdot X_i$ first becomes an equality, which occurs when

$$b = \min_{i=0, \dots, n} (p \cdot X_i - d_i)$$

where $d_0 = 0$. Let j is the package on which this minimum is achieved.

85. The relative caps will still be satisfied for this higher b (as these constraints are independent of b). We have thus a situation in which X_j receives at bid at round prices p and no other package in the loop exceeds round prices p , i.e.

$$\beta(X_i) = b + d_i \leq p \cdot X_i \text{ for all } i = 0, \dots, X_n \text{ and}$$

$$\beta(X_j) = b + d_j = p \cdot X_j \text{ for some } j.$$

Therefore a relaxed primary bid for X_j is possible at round prices p .

86. This demonstrates that at least one of X_0, X_1, \dots, X_n will allow a relaxed primary bid at round prices p . However, notice that X_j is not necessarily unique, as there may be multiple choices of d_1, \dots, d_n consistent with the relative caps.

Annex B Amendments to the IM

This annex presents a set of proposed amendments to Chapter 4 and Annex 1 of the IM (ComReg 12/52). If adopted by ComReg, these amendments will implement the Constrained Package re-setting rule set out in this report.

The proposed amendments implement a revised definition of the Constraining Package and Constraining Round. A number of small textual changes are then needed to ensure that where the concepts of Constraining Packages and Constraining Rounds are used, these implement the revised definition.

We recommend that ComReg implements these amendments to the IM.

Additions of text to the IM are shown in blue and are underlined where interspersed with the existing text. Deletions are struck-through and shown in red.

Text in italic black type in this annex is explanatory and is not intended to form part of the IM as amended.

B.1 Use of constraining package and round in definition of chain bids

Four additional paragraphs and a new sub-section heading are added directly after paragraph 4.82. These explain in more detail the definition of the Relative Cap and ensure that the rules maintain a linkage between Relative Caps as eligibility is reduced (in line with the description in paragraph 4.156). The new paragraphs are numbered 4.82A to 4.82D to avoid affecting the numbering of subsequent paragraphs.

Eligibility-reducing Primary Bids and Relative Caps

- 4.82A A reduction of Eligibility in a Primary Bid Round will result in a Relative Cap being created on the Bids that the Bidder can subsequently make for certain packages of Lots that the Bidder could have bid for in that round, but chose not to. The Relative Caps that apply to a Bidder must be respected when submitting Supplementary Bids and also when submitting Relaxed Primary Bids, as explained in paragraphs 4.83 to 4.101 below. Specifically, the potential need for Chain Bids associated with a Relaxed Primary Bid arises from the requirement that Relative Caps already in force are respected throughout the Primary Bid Rounds.
- 4.82B A Relative Cap on any package X is defined by reference to the **Constraining Round** applying to package X. Let round R be the Constraining Round for package X, when the Bidder bid for package Y (referred to as the **Constraining Package** for package X). The Relative Cap limits any Bid that the Bidder may subsequently submit for package X to:
- a) the highest Bid submitted for the Constraining Package Y; **plus**
 - b) the difference in price between X and Y at the Round Prices prevailing in Round R.

This condition requires that the Bidder must respect the preferences revealed by its choice, made in the Constraining Round, when it chose the Constraining Package in preference to package X at prevailing Round Prices.

4.82C The Constraining Round for a package X is defined as follows:

- a) Suppose that a Bidder makes a Primary Bid for package Y in Round R that results in a reduction in Eligibility. Suppose that the Bidder was eligible to bid for package X in Round R, but not from Round R+1 onwards due to the reduction in Eligibility in Round R. Then the Constraining Round of package X is set to be Round R.
- b) The Constraining Round for package X may subsequently be re-set in the course of the Primary Bids Rounds in certain circumstances after the Bidder has made an eligibility-reducing Relaxed Primary Bid. Specifically, the Constraining Round for package X would be re-set at the end of a Primary Bid Round R **if**
 - i) The Bidder submitted an eligibility-reducing Primary Bid in Round R for package Y;
 - ii) The most recent eligibility-reducing Primary Bid made by the Bidder prior to Round R was a Relaxed Primary Bid;
 - iii) Package X was subject to an eligibility-reducing Primary Bid in some Round S prior to Round R;
 - iv) The Bidder was able to make a Primary Bid for package X in Round R; and
 - v) There was no other package that was subject to an eligibility-reducing Primary Bid prior to Round R and subsequent to Round S for which the Bidder could have submitted a Primary Bid in Round R;

then the Constraining Round for package X will be set to Round R (and so the Constraining Package for package X will become package Y).

4.82D Notice that:

- a) The re-setting of a Constraining Round may only occur if a Bidder has made an eligibility-reducing Relaxed Primary Bid.
- b) The resetting only occurs if the Bidder reduces eligibility subsequent to this eligibility-reducing Relaxed Primary Bid; this is necessary to maintain the linkage of Relative Caps from smaller to larger packages created as the Bidder reduces Eligibility in the course of the Primary Bid Rounds.
- c) The Constraining Round will only be re-set for a package of Lots that the Bidder would have been able to bid for in this Round but chose not to.

B.2 Introductory comments about relative caps

Amendment needed to pick up the refined definition of Constraining Round and Constraining Packages:

4.52 The Relative Cap limits the Bid Amount of a Supplementary Bid for a package of Lots X relative to the highest Bid Amount submitted for ~~the~~

package of Lots (the **Constraining Package**) Bid on in the last Primary Bid Round (the **Constraining Round**) when the Bidder was eligible to bid for package X its **Constraining Package** of Lots bid for in the **Constraining Round**, as defined in 4.82A below. In the Constraining Round, the Bidder did not bid for package X, but instead dropped Eligibility (in at least one Time Slice) by bidding for the Constraining Package. The Bid Amount that the Bidder can subsequently submit for X in excess of the Bid Amount for the Constraining Package is limited to the Revealed Value Differential between these packages of Lots given the Round Prices in the Constraining Round.

4.53 Relative Caps arise due only as a result of a Bidder dropping Eligibility during the Primary Bid Rounds. If a Bidder entered a round with Eligibility E, but bid for a package Y with associated Eligibility (in at least one Time Slice) that is strictly lower than E (and so has lower Eligibility in the following round), then the Bid made in that round for Y will determine the Relative Caps on all packages with Eligibility E (and indeed all packages for which this is the last round that the Bidder will have Eligibility to bid for them). All such packages will have package Y as their Constraining Package. However, if the Bidder does not drop Eligibility in either Time Slice, then no relative caps are created by its Bid in that Primary Bid Round.

3.1 References to constraining rounds in the definition of chain bids

Small changes are then needed to the paragraphs referring to Constraining Rounds when defining Chain Bids to ensure that the Relative Cap as defined above is then applied.

4.88 Let Primary Bid Round M1 be the ~~most recent round in which B was eligible to bid~~ **Constraining Round** for package X. A Chain Bid may be required on the Constraining Package Z1 that was subject to a Bid in Primary Bid Round M1 unless B has already made a Bid of a sufficiently large amount. The amount of the required Chain Bid for package of Lots Z1 is equal to:

- a) The Bid Amount associated with the Relaxed Primary Bid for X (i.e. the price of package of Lots X at current Round Prices); minus
- b) The difference in price between package of Lots X and package of Lots Z1 at the Round Prices in Primary Bid Round M1.

...

4.91 Conversely, if B is not currently eligible to bid for package of Lots Z1, let M2 be the ~~most recent Primary Bid Round in which B was eligible to bid~~ **Constraining Round** for Z1. A Chain Bid may be required on the Constraining Package of Lots Z2 that was subject to a Primary Bid in round M2, unless B has already made a Bid of a sufficiently large amount. The amount of this Chain Bid for package of Lots Z2 is equal to:

- a) The amount of the Chain Bid for Z1 (determined above) minus
- b) The difference in price between Z1 and Z2 at the Round Prices in round M2.

...

4.95 Assume that B is not eligible to bid for a previously defined package of Lots Zk subject to a required Chain Bid. ~~Determine the most recent Primary Bid Round-Let Mk+1 in which B was eligible to bid~~ be the Constraining Round for Zk. A Chain Bid may be required on the package Zk+1 that was subject to a Primary Bid in round Mk. The amount of this Chain Bid for package Zk+1 is equal to:

- a) The amount of the Chain Bid for package Zk (previously determined) minus
- b) The difference in price between package Zk and the package Zk+1 at the round Mk prices.

B.3 Use of constraining package and round in definition of relative caps on supplementary bids

Small changes are needed in the application of the Relative Caps to Supplementary Bids to bring the revised definition of a Constraining Round into effect.

- 4.155 Specifically, the Supplementary Bid for any such package of Lots X with Eligibility is subject to a Relative Cap calculated as follows:
- Suppose that Round n is the Constraining Round ~~the Bidder was last eligible to bid for package of Lots X in round n (the Constraining Round)~~;
 - In round n, the Bidder's Primary Bid was for some package of Lots Y (the Constraining Package);
 - the Supplementary Bid for X cannot exceed the Bid for Y (i.e. the Supplementary Bid for Y or the highest Bid in the Primary Bid Rounds if no Supplementary Bid was submitted for Y) plus the price difference between the price of X and Y at the Round Prices that prevailed in round n.
- 4.156 Notice that package of Lots Y above will itself be subject to a Relative Cap in respect of some other package of Lots, unless Y is a package that the Bidder is eligible to bid for in the final Primary Bid Round. The rule above has the effect of creating a chain of constraints that cap the Supplementary Bid for any package of Lots X exceeding the Bidder's Eligibility in the final Primary Round relative to the last eligibility-reducing Bid made for a package of Lots not exceeding the Bidder's Eligibility in the final Primary Round.

...

- 4.159 Specifically, suppose that ~~the Bidder was last eligible to bid for its~~ Round n is the Constraining Round for the Final Primary Package F, ~~other than by use of a Relaxed Primary Bid, in round n (the Constraining Round)~~. This will not be the last Primary Bid Round, as the Bidder was not eligible to bid for F in the last Primary Round and so made a Relaxed Primary Bid. Suppose that in round n, the Bidder bid for package of Lots Y (the Constraining Package). Then the Supplementary Bid for F cannot exceed the highest Bid for Y (i.e. the Supplementary Bid for Y or the highest Bid in the Primary Bid Rounds if no

Supplementary Bid was submitted for Y) plus the price difference between the price of F and Y at the Round Prices in round n.

B.4 Glossary definition of relative cap (Annex 1 of IM)

Update the definition of the Relative Cap to reflect the change in Constraining Round

Relative Cap - A cap applying to a Supplementary Bid, which limits the Bid Amount for a Package of Lots to:

- the Price of the Package of Lots in the ~~last Primary Bid Round~~ Constraining Round, in which the Bidder was ~~eligible~~ able to Bid for the Package of Lots; plus
- the difference in value between that Package of Lots and the Package of Lots actually Bid for instead (the Constraining Package) at the Round Prices prevailing in ~~the same Primary Bid Round~~ (the Constraining Round)

Annex C Amendments to Annex 7 of the IM

The calculations underlying the examples in Annex 7 of the IM remain essentially unchanged by the proposed amendments presented in Annex B. This is because, based on the examples set out therein, the only round after which a constraining round would have to be re-set is the Final Primary Round. Therefore, the Final Price Cap already captures the effect of re-setting the Relative Cap and there is no material change to the effective constraints on Supplementary Bids.

Nevertheless, Annex 7 can be used as an example of how the Constraining Round re-set rule would apply. We have, therefore, provided an amended version of Annex 7 that illustrates these calculations. We recommend that ComReg implements these changes to the IM.

Annex 7: Worked Example of Activity Rules for the Primary Bid Rounds and Caps on Supplementary Bids

- A 7.1 This annex presents an updated example of a Bidder bidding across a number of Primary Bid Rounds and then making some Supplementary Bids¹²⁴. For simplicity, the example only considers Bids for packages consisting of Lots in two Lot Categories, 800/1 and 800/2. The example is shown in several variations by reducing the number of auction rounds to illustrate the different possible types of Final Primary Packages.
- A 7.2 Suppose that the Bidder in question has no Party-Specific Lot Categories for which it can Bid and is only interested in two Lot Categories, 800/1 and 800/2. The Bidder has the following valuations for different packages of Lots across these Lot Categories:

Package name	Number of 800/1 Lots	Number of 800/2 Lots	Bidders ¹²⁵ valuation	Activity of package ¹²⁶
1	2	1	€64m	(4,2)
2	1	3	€88m	(2,6)
3	2	3	€92m	(4,6)
4	1	1	€45m	(2,2)

Table 13: Packages of Lots and corresponding valuations and activity

- A 7.3 Suppose that the Bidder selected package 3 in its application. This means that the Bidder has an Initial Eligibility of 4 Eligibility Points in Time Slice 1 and 6 Eligibility Points in Time Slice 2. This will be treated as an initial Bid for package 3 at the reserve price, i.e.

¹²⁴ All figures used in this Annex except in respect of Reserve Prices have been chosen as examples to reveal certain features of the Auction and accordingly, they do not represent any belief on behalf of ComReg or DotEcon that any such figures are likely to be achieved in the Auction.

¹²⁵ While Bidders will have their own approaches to valuing spectrum, for the purposes of this example, this can usefully be thought of as being the net present value of the profit that the Bidder expects it would make if it obtained Licences in respect of the packages at zero cost.

¹²⁶ (Time Slice 1, Time Slice 2).

€29.88m¹²⁷ which is $2 \times \text{€}2.55\text{m}$ (Reserve Price of a 800/1 Lot) plus $3 \times \text{€}8.26\text{m}$ (Reserve Price of a 800/2 Lot).

A 7.4 For the Main Stage of the Auction to be run, then there must exist at least one Lot Category that is oversubscribed given the aggregate demand for Lots from all of the Bids made. For the purposes of this example, suppose that this excess demand occurred in one or more categories other than 800/1 and 800/2 and that there was no excess demand in either of these two categories at the Application Stage. Therefore, the Round Prices will be equal to the reserve prices for the first Primary Bid Round as there is no price increment needed for either of these two categories.

A7.1 Primary Bid Rounds

A 7.5 The following table provides an overview of Bids that the Bidder makes across seven successive Primary Bid Rounds given the Round Prices¹²⁸ of the two Lot Categories. This table shows the payoff associated with each of the three packages (i.e. the valuation less the price of the package) given the Round Prices. We adopt the assumption that, in each round, the Bidder will Bid on its most preferred package (the package with the highest payoff amongst those for which it is able to Bid). This package is shown in blue and is assumed to be the package that is Bid for in each round. This assumption about bidding behaviour is made solely for the purposes of illustrating how the activity rules on Primary Bids operate.

¹²⁷ Reserve prices are used here by way of example only.

¹²⁸ To render the example more easily understandable the cap on the increase in the prices of lots per round is ignored in this Annex.

Round	Round Price of 800/1 Lots (€m)	Round Price of 800/2 Lots (€m)	Package 1 (2,1)		Package 2 (1,3)		Package 3 (2,3)		Package 4 (1,1)		Eligibility (Time Slice 1, Time Slice 2)	Activity (Time Slice 1, Time Slice 2)	Type of Bid
			Price	Payoff	Price	Payoff	Price	Payoff	Price	Payoff			
1	2.55	8.26	13.36	50.64	27.33	60.67	29.88	62.12	10.81	34.19	(4,6)	(4,6)	Standard
2	5	9	19	45	32	56	37	55	14	31	(4,6)	(2,6)	Standard
3	10	10	30	34	40	48	50	42	20	25	(2,6)	(2,6)	Standard
4	14	20	48	16	74	14	88	4	34	11	(2,6)	(4,2)	Relaxed
5	19	21	59	5	82	6	101	-9	40	5	(2,2)	(2,6)	Relaxed
6	20	23	63	1	89	-1	109	-17	43	2	(2,2)	(2,2)	Standard
7	25	25	75	-11	100	-12	125	-33	50	-5	(2,2)	(0,0)	Zero Bid

Table 14: Bid submitted in the Primary Bid Rounds

Round 1

A 7.6 The Bidder's preferred package at the Round Prices for round 1 is package 3, which has an activity of (4,6). The Bidder is eligible to Bid for this package.

A 7.7 The Bidder's Eligibility for the following round in each Time Slice is equal to the smaller of the Bidder's Eligibility and the Bidder's activity in that Time Slice in the current round. We therefore calculate the Eligibility of the Bidder for round 2 as follows:

- a) The activity associated with the Bid for package 3 in Time Slice 1 is 4, which is equal to the Bidder's Eligibility in this Time Slice. Therefore, the Bidder's Eligibility for Time Slice 1 will be maintained at 4.
- b) The activity associated with this Bid in Time Slice 2 is 6, which is equal to the Bidder's Eligibility in this Time Slice. Therefore, the Eligibility of the Bidder for Time Slice 2 will be maintained at 6.
- c) Thus the Eligibility for round 2 is (4,6).

Round 2 (bidder drops Eligibility)

A 7.8 The Bidder's preferred package at the Round Prices for round 2 is package 2, which has an activity of (2,6). The Bidder is eligible to Bid for this package.

A 7.9 We calculate the Eligibility of the Bidder for round 3 as follows:

- a) The activity associated with the Bid for package 2 in Time Slice 1 is 2, which is smaller than the Bidder's Eligibility in this Time Slice. Therefore, the Bidder's Eligibility for Time Slice 1 will be reduced to 2.
- b) The activity associated with this Bid in Time Slice 2 is 6, which is equal to the Bidder's Eligibility in this Time Slice. Therefore, the Eligibility of the Bidder for Time Slice 2 will be maintained at 6.

A 7.10 Thus the Eligibility for round 3 is (2,6). [This reduction in Eligibility results in Relative Caps on the packages which the Bidder was Eligible to bid for in this round, but will not be Eligible to bid for from the following round onwards. These include packages 1 and 3 in Table 13. Therefore, the Constraining Round for these packages is set to round 2. As the Bidder has not yet submitted any Eligibility-reducing Relaxed Primary Bids, there is no need for resetting the Constraining Round for any packages already subject to a Relative Cap.](#)

Round 3

A 7.11 The Bidder's preferred package at the Round Prices for round 2 is again package 2. The Bidder is eligible to Bid for this package, and maintains its Eligibility by continuing to Bid on the same package.

A 7.12 Thus the Eligibility for round 4 is (2,6).

Round 4 (Relaxed Primary Bid, bidder drops Eligibility)

A 7.13 The Bidder's preferred package at the Round Prices for round 4 is package 1. The Eligibility of this package exceeds the Eligibility of the Bidder in Time Slice 1. However, given the Round Prices in round 4, the bidder may submit a Relaxed Primary Bid for this package, as explained below.

A 7.14 We first establish the Relative Cap that applies to Bids for package 1, and identify the Constraining Package that might require a Chain Bid:

- a) ~~The last round in which the Bidder was eligible to Bid for package 1 was round 2; therefore, round 2 is the Constraining Round.~~ The Constraining Round for package 1 is round 2.
- b) In round 2, the Bidder Bid on package 2. Therefore, package 2 is the Constraining Package for calculating the Relative Cap on the Bids for package 1. A Chain Bid may be required for package 2.
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 1) and the Constraining Package (package 2) in the Constraining Round (round 2). The price of these packages in the Constraining Round was €19m for package 1 and €32m for package 2. Therefore, the Revealed Value Differential is €19m – €32m = – €13m.
- d) The highest Bid that the Bidder may submit for package 1 cannot exceed the highest Bid that the Bidder submits for package 2 **minus** €13m.

A 7.15 The Bid amount of the Chain Bid for package 2 is determined in the following way:¹²⁹

- a) The Bid Amount for package 1 at the Round Prices in round 4 is €48m.
- b) This Bid Amount cannot exceed the highest Bid for package 2 minus €13m.
- c) Therefore, to be able to make the Relaxed Primary Bid for package 1 in round 4, the Bidder must, by the end of round 4, have made a bid for for package 2 of at least €48m + €13m = €61m.
- d) The minimum Bid Amount for package 2 identified in c) above is higher than the highest Bid that the Bidder has submitted for package 2 so far (the Primary Bid of €40m made in round 3). Therefore, the Bidder must submit a Chain Bid of €61m for package 2 in order to be able to make a Relaxed Primary Bid for package 1 in round 4.

¹²⁹ In practise the EAS will calculate the level of any Chain Bids required.

A 7.16 In order for a Relaxed Primary Bid for package 1 to be permissible, it is necessary that none of its associated Chain Bids exceed the price of the package subject to the Chain Bid at current Round Prices. The required Bid Amount for the Chain Bid on package 2 is €61m, and the price of this package in round 4 is €74m. Therefore, this requirement is met in relation to the Chain Bid for package 2.

A 7.17 We now need to check whether any further Chain Bids might be required, for the Bidder to be able to submit the Chain Bid for package 2. The Bidder is currently eligible to Bid for package 2, and hence no further Chain Bids are needed.

A 7.18 Therefore, the Relaxed Primary Bid for package 1 at €48m is permitted, provided that the Bidder also submits a Chain Bid of €61m for package 2.

A 7.19 We calculate the Eligibility of the Bidder for round 5 as follows:

- a) The activity associated with the Relaxed Primary Bid for package 1 in Time Slice 1 is 4, which is greater than the Bidder's Eligibility in this Time Slice. Therefore, the Bidder's Eligibility for Time Slice 1 will be maintained at 2.
- b) However, the activity associated with this Bid in Time Slice 2 is 2, which is smaller than the Bidder's Eligibility in this Time Slice. Therefore, the Eligibility of the Bidder for Time Slice 2 will be reduced to 2.
- c) Thus the Eligibility for round 5 is (2,2).
- d) This reduction in Eligibility results in Relative Caps on the packages which the Bidder was Eligible to bid for in this round, but will not be Eligible to bid for from the following round onwards. These include package 2 in Table 13. Therefore, the Constraining Round for this packages is set to round 4.
- e) The Bidder has now submitted an Eligibility-reducing Relaxed Primary Bid. However, as the Bidder has not made any further Eligibility-reducing Bids, there is no need for resetting the Constraining Round for any packages already subject to a Relative Cap.

Round 5

A 7.20 The Bidder's preferred package at the Round Prices for round 5 is package 2. The Eligibility of this package exceeds the Eligibility of the Bidder in Time Slice 2. However, given the Round Prices in round 5, the bidder may submit a Relaxed Primary Bid for this package, as explained below.

A 7.21 As before, we first establish the Relative Cap that applies to Bids for package 2, and identify the Constraining Package that might require a Chain Bid:

- a) ~~The last round in which the Bidder was eligible to Bid for package 2 was round 4; therefore, round 4 is the Constraining Round.~~ The Constraining Round for package 2 is round 4.
- b) In round 4, the Bidder Bid on package 1. Therefore, package 1 is the Constraining Package for calculating the Relative Cap on the Bids for package 2. A Chain Bid may be required for package 1.
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 2) and the Constraining Package (package 1) in the Constraining Round (round 4). The price of these packages in the Constraining Round was €74m for package 2 and €48m for package 1. Therefore, the Revealed Value Differential is €74m – €48m = €26m.
- d) The highest Bid that the Bidder could submit for package 2 cannot exceed the highest Bid that the Bidder submits for package 1 **plus** €26m.

A 7.22 The Bid Amount of the Chain Bid required for package 1 is determined in the following way:¹³⁰

- a) The Bid Amount for package 2 at the Round Prices in round 5 is €82m.
- b) This Bid Amount cannot exceed the highest Bid for package 1 plus €26m.
- c) Therefore to be able to make the Relaxed Primary Bid for package 2 in round 5, the Bidder must, by the end of round 5, have made a bid for for package 1 of at least €82m – €26m = €56m.
- d) The minimum Bid Amount for package 1 identified in c) above is higher than the highest Bid that the Bidder has submitted for package 1 so far (the Relaxed Primary Bid of €48m made in round 4). Therefore, the Bidder must submit a Chain Bid of €56m for package 1 in order to be able to make a Relaxed Primary Bid for package 2 in round 5. Let “CH1” denote this Chain Bid for package 1.

A 7.23 In order for a Relaxed Primary Bid for package 2 to be permissible, it is necessary that none of its associated Chain Bids exceed the price of the package subject to the Chain Bid at current Round Prices. The required Bid Amount for the Chain Bid on package 1 is €56m, and the price of this package in round 5 is €59m. Therefore, this requirement is met in relation to the Chain Bid CH1.

¹³⁰ In practice the EAS will calculate the level of any Chain Bids required.

A 7.24 We now need to check whether any further Chain Bids might be required, for the Bidder to be able to submit the Chain Bid *CH1*.

A 7.25 The Eligibility of package 1 exceeds the Bidder's Eligibility in Time Slice 1. Therefore, Bids for package 1 are subject to a Relative Cap, described in paragraph A 7.14 and the ability to submit the Chain Bid *CH1* is determined in the following way:

- a) The Bid Amount for *CH1* is €56m.
- b) This Bid Amount cannot exceed the highest Bid for package 2 minus €13m.
- c) Therefore, the highest Bid that the Bidder submits for package 2 must be at least €56m + €13m = €69m.
- d) This Bid Amount is higher than the highest Bid that the Bidder has submitted for package 2 so far (the Chain Bid of €61m made in round 4). Therefore, the Bidder must increase its Bid for package 2 in order to make the Chain Bid *CH1*. However, the Bidder wishes to submit a Relaxed Primary Bid for package 2 in this round, with a Bid Amount of €82, and therefore exceeding the Bid Amount of €69 that would be required for the Chain Bid *CH1* to be possible. Therefore, this requirement will be satisfied without need of any further Chain Bids.

A 7.26 As there are no further constraints on the Bids for these packages, the Relaxed Primary Bid for package 2 at €82m is permitted, provided that the Bidder also submits a Chain Bid of €56m for package 1.

A 7.27 We calculate the Eligibility of the Bidder for round 6 as follows:

- a) The activity associated with the Relaxed Primary Bid for package 2 in Time Slice 1 is 2, which is equal to the Bidder's Eligibility in this Time Slice. Therefore, the Bidder's Eligibility for Time Slice 1 will be maintained at 2.
- b) The activity associated with this Bid in Time Slice 2 is 6, which is greater than the Bidder's Eligibility in this Time Slice. Therefore, the Eligibility of the Bidder for Time Slice 2 will be maintained at 2.
- c) Thus the Eligibility for round 6 is (2,2).

Round 6

A 7.28 The Bidder's preferred package at the Round Prices for round 6 is package 4, which has an activity of (2,2). The Bidder is eligible to Bid for this package.

A 7.29 We calculate the Eligibility of the Bidder for round 7 as follows:

- a) The activity associated with the Bid for package 4 in Time Slice 1 is 2, which is equal to the Bidder's Eligibility in this Time Slice.

Therefore, the Bidder's Eligibility for Time Slice 1 will be maintained at 2.

- b) The activity associated with this Bid in Time Slice 2 is 2, which is equal to the Bidder's Eligibility in this Time Slice. Therefore, the Eligibility of the Bidder for Time Slice 2 will be maintained at 2.

A 7.30 Thus the Eligibility for round 7 is (2,2).

Round 7 (Bidder drops out)

A 7.31 In round 7, the Round Prices have increased to a level at which it is not profitable to Bid for any package given the Bidder's valuations. The Bidder submits a Zero Bid and therefore the Bidder's Eligibility will be reduced to 0 in both Time Slices. Therefore:

- a) This reduction in Eligibility results in Relative Caps on the packages which the Bidder was Eligible to bid for in this round, but will not be Eligible to bid for from the following round onwards. These include package 4 in Table 13. Therefore, the Constraining Round for this packages is set to round 7.
- b) As this is the first reduction in Eligibility after the Bidder submitted an Eligibility-reducing Relaxed Primary Bid in round 4, we need to re-set the Constraining Round for one of the packages the Bidder has submitted an Eligibility-reducing Primary Bid, as detailed in paragraph 4.82[iii].
- c) We first look at whether the Bidder was able to submit a Relaxed Primary Bid for the package it bid for in its most recent Eligibility-reducing round (round 4):
 - i. In round 4, the Bidder submitted an Eligibility-reducing Relaxed Primary Bid for package 1, which is subject to the Relative Cap described in paragraph A 7.14;
 - ii. Package 1 has a price of €75m in the current round;
 - iii. The highest Bid that the Bidder may submit for package 1 cannot exceed the highest Bid that the Bidder submits for package 2 *minus* €13m;
 - iv. Therefore, the necessary Bid on package 2 would be €75m + €13 = €88m. The highest Bid submitted by the Bidder for package 2 so far is €82m. Therefore, a Chain Bid for package 2 would be required;
 - v. The Bid Amount of this Chain Bid for package 2 does not exceed the price of package 2 in the current round, but additional Chain Bids could be required (which we need to check next);

- vi. Package 2 is currently subject to a Relative Cap described in paragraph A 7.21;
 - vii. The highest Bid that the Bidder may submit for package 2 cannot exceed the highest Bid that the Bidder submits for package 1 **plus** €26m;
 - viii. Therefore, the necessary Bid on package 1 would be €88m - €26 = €62m. As the Relaxed Primary Bid for package 1 would be above this, no additional Chain Bids would be required.
- d) As the Bidder would have been able to submit a Relaxed Primary Bid for package 1, which is the package subject of the most recent Eligibility-reducing Primary Bid, then the Constraining Round for package 1 will be re-set to this round (round 7).

A 7.32 If any further rounds were run, then the Bidder would not be able to place any further Primary Bids.

End of the Primary Bid Rounds

A 7.33 At the end of the Primary Bid Rounds, the Bidder will have placed the Bids shown in the following table, where the highest Bid for each package is highlighted in blue.

Round in which Bid was placed	Package Bid for	Amount of Bid (€m)	Type of Bid
1	3	29.88	Standard Primary Bid
2	2	32	Standard Primary Bid
3	2	40	Standard Primary Bid
4	1	48	Relaxed Primary Bid
4	2	61	Chain Bid
5	2	82	Relaxed Primary Bid
5	1	56	Chain Bid
6	4	43	Standard Primary Bid
7	0	0	Zero Bid

A7.2 Supplementary Bids Round

A 7.34 In the Supplementary Bids Round, Bidders may submit Supplementary Bids subject to both the Relative Caps that arise from Primary Bid Rounds in which they dropped Eligibility and the Final Price Cap relative to their Final Primary Package. Below we consider some variations based on the example above to show how these caps are determined in the Supplementary Bids Round depending on whether the Bidder submitted Zero Bid, a standard Primary Bid or a Relaxed Primary Bid in the final Primary Bid Round.

Example of a Bidder who submits the Zero Bid in the final Primary Bid Round

A 7.35 Suppose that round 7 is the final Primary Bid Round. The Final Primary Package for this Bidder is the zero package (i.e. no Lots in any Lot Category). Because all packages will be capped relative to the Bid for the zero package, and given that the Bidder may not submit a Supplementary Bid for the zero package, there will effectively be an absolute cap on each of the Supplementary Bids that the Bidder can submit.

A 7.36 The Relative Caps for each one of the four packages in the example are determined in the following way.

A 7.37 Relative Cap for **package 1**:

- ~~a) The last round in which the Bidder was eligible to Bid for package 1 was round 2; therefore, round 2 is the Constraining Round.~~
- ~~b) In round 2, the Bidder Bid on package 2. Therefore, package 2 is the Constraining Package for calculating the Relative Cap on the Bids for package 1.~~
- ~~c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 1) and the Constraining Package (package 2) in the Constraining Round (round 2). The price of these packages in the Constraining Round was €19m for package 1 and €32m for package 2. Therefore, the Revealed Value Differential is €19m – €32m = –€13m.~~
- ~~d) The highest Bid that the Bidder submits for package 1 cannot exceed the highest Bid that the Bidder submits for package 2 **minus** €13m.~~
- a) The Constraining Round for package 1 is round 7.
- b) In round 7, the Bidder Bid on the Zero Package. Therefore, the Zero Package is the Constraining Package for calculating the Relative Cap on the Bids for package 1.
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 1) and the Constraining Package (the Zero Package) in the Constraining Round (round 7). Therefore the Revealed Value Differential is the price of package 1 in round 7, €75m.
- d) As the Bidder may not submit a positive Bid for the Zero Package, the highest Bid that the Bidder submits for package 1 cannot exceed €75m.

A 7.38 Relative Cap for **package 2**:

- a) The last round in which the Bidder was eligible to Bid for package 2 was round 4; therefore, round 4 is the Constraining Round.

- b) In round 4, the Bidder Bid on package 1. Therefore, package 1 is the Constraining Package for calculating the Relative Cap on the Bids for package 2.
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 2) and the Constraining Package (package 1) in the Constraining Round (round 4). The price of these packages in the Constraining Round was €74m for package 2 and €48m for package 1. Therefore, the Revealed Value Differential is €74m – €48m = €26m.
- d) The highest Bid that the Bidder submits for package 2 cannot exceed the highest Bid that the Bidder submits for package 1 **plus** €26m.

A 7.39 Relative Cap for **package 3**:

- a) The last round in which the Bidder was eligible to Bid for package 3 was round 2; therefore, round 2 is the Constraining Round.
- b) In round 2, the Bidder Bid on package 2. Therefore, package 2 is the Constraining Package for calculating the Relative Cap on the Bids for package 3.
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 3) and the Constraining Package (package 2) in the Constraining Round (round 2). The price of these packages in the Constraining Round was €37m for package 3 and €32m for package 2. Therefore, the Revealed Value Differential is €37m – €32m = €5m.
- d) The highest Bid that the Bidder submits for package 3 cannot exceed the highest Bid that the Bidder submits for package 2 **plus** €5m.

A 7.40 Relative Cap for **package 4**: ~~the Eligibility of package 4 does not exceed the Bidder's Eligibility in the final Primary Bid Round, and therefore package 4 is not subject to a Relative Cap.~~

- a) The Constraining Round for package 4 is round 7;
- b) In round 7, the Bidder Bid on the Zero Package. Therefore, the Zero Package is the Constraining Package for calculating the Relative Cap on the Bids for package 4;
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 4) and the Constraining Package (the Zero Package) in the Constraining Round (round 7). Therefore the Revealed Value Differential is the price of package 4 in round 7, €50m;

- d) As the Bidder may not submit a positive Bid for the Zero Package, the highest Bid that the Bidder submits for package 4 cannot exceed €50m.

A 7.41 In addition to the Relative Caps, all packages are subject to a Final Price Cap relative to the Final Primary Package. As in this case the Final Primary Package is the zero package, this means that none of the Supplementary Bids that the Bidder may submit can exceed the price of the package in the final Primary Bid Round. Therefore, each package is subject to a Final Price Cap equal to the price of the package in the final Primary Bid Round.

A 7.42 The following table provides an overview of the caps that would apply to the Supplementary Bids that the Bidder can submit. In this table, HB(X) stands for the "highest Bid submitted for package X".

Package	Relative Cap	Final Price Cap
1	HB(2) – €13m €75m	€75m
2	HB(1) + €26m	€100m
3	HB(2) + €5m	€125m
4	NONE €50m	€50m

A 7.43 ~~Notice that the Bids for packages 1 and 2 are mutually capped in relation to each other. However, the Relative Caps simply require that the difference between the Bid Amounts set for packages 2 and 1, i.e. the difference HB(2) – HB(1), cannot be smaller than €13m and cannot be greater than €26m.~~

A 7.44 Given these caps, which result from bidding for the most preferred package in each Primary Bid Round, the Bidder can reflect its true valuations in its Supplementary Bids. The table below shows the Supplementary Bid Amounts that would reflect the Bidder's valuations and the resulting caps:

Package	Supplementary Bid Amount	Relative cap	Final Price Cap
1	€64m	€88m – €13m = €75m	€75m
2	€88m	€64m + €26m = €90m	€100m
3	€92m	€88m + €5m = €93m	€125m
4	€45m	€50m	€50m

Example of a Bidder who submits a standard Primary Bid in the final Primary Bid Round

A 7.45 Suppose now that round 6 is the final Primary Bid Round, in which the Bidder submitted a standard Primary Bid. The Final Primary Package (which the Bidder Bid for in round 6) is package 4.

A 7.46 Without the further Eligibility reduction in round 7, there is no need to re-set the Constraining Round for any packages. Therefore the Constraining Round for package 1 would remain to be round 2. Thus, the Relative Cap for package 1 would be calculated as follows:

- a) The last round in which the Bidder was eligible to Bid for package 1 was round 2; therefore, round 2 is the Constraining Round;
- b) In round 2, the Bidder Bid on package 2. Therefore, package 2 is the Constraining Package for calculating the Relative Cap on the Bids for package 1;
- c) The Revealed Value Differential for calculating the Relative Cap is the difference in price between the package subject to the Relative Cap (package 1) and the Constraining Package (package 2) in the Constraining Round (round 2). The price of these packages in the Constraining Round was €19m for package 1 and €32m for package 2. Therefore, the Revealed Value Differential is €19m – €32m = – €13m;
- d) The highest Bid that the Bidder submits for package 1 cannot exceed the highest Bid that the Bidder submits for package 2 **minus** €13m.

A 7.47 The Relative Caps for packages ~~1~~, 2 and 3 are calculated as detailed in paragraphs ~~A 7.37~~ A 7.38 to A 7.40 above.

A 7.48 All packages except the Final Primary Package are subject to a Final Price Cap relative to the Final Primary Package (package 4). The Final Price Cap limits the Bid Amount for any Package other than package 4 to be no greater than:

- a) the highest Bid that the Bidder submits for package 4; plus
- b) the difference in price between package 4 and the package subject to the Final Price Cap in the final Primary Bid Round.

A 7.49 The price of package 4 in the final Primary Bid Round (round 6) was €43m. The prices of the other three packages in the final Primary Bid Round, and the corresponding Final Price Caps are as follows:

- a) The price of package 1 in round 6 was €63m, therefore the highest Bid that the Bidder may submit for package 1 cannot exceed the highest Bid that the Bidder submits for package 4 **plus** €20m (resulting from the difference between €63m and €43m).
- b) The price of package 2 in round 6 was €89m, therefore the highest Bid that the Bidder may submit for package 2 cannot exceed the highest Bid that the Bidder submits for package 4 **plus** €46m (resulting from the difference between €89m and €43m).

- c) The price of package 3 in round 6 was €109m, therefore the highest Bid that the Bidder may submit for package 3 cannot exceed the highest Bid that the Bidder submits for package 4 **plus** €66m (resulting from the difference between €109m and €43m).

A 7.50 The following table provides an overview of the caps that would apply to the Supplementary Bids that the Bidder can submit. In this table, HB(X) stands for the "highest Bid submitted for package X".

Package	Relative cap	Final Price Cap
1	HB(2) – €13m	HB(4) + €20m
2	HB(1) + €26m	HB(4) + €46m
3	HB(2) + €5m	HB(4) + €66m
4	NONE	NONE

A 7.51 Notice that no caps apply to the Supplementary Bid Amount that the Bidder can submit for package 4.

A 7.52 Given these caps, which result from bidding for the most preferred package in each Primary Bid Round, the Bidder can reflect its true valuations in its Supplementary Bids. The table below shows the Supplementary Bid Amounts that would reflect the Bidder's valuations and the resulting caps:

Package	Supplementary Bid Amount	Relative cap	Final Price Cap
1	€64m	€88m – €13m = €75m	€45m + €20m = €65m
2	€88m	€64m + €26m = €90m	€45m + €46m = €91m
3	€92m	€88m + €5m = €93m	€45m + €66m = €111m
4	€45m	NONE	NONE

Example of a Bidder who submits a Relaxed Primary Bid in the final Primary Bid Round

A 7.53 Suppose now that round 5 is the final Primary Bid Round, in which the Bidder submitted a Relaxed Primary Bid. The Final Primary Package (which the Bidder Bid for in round 5) is package 2.

A 7.54 The Relative Caps for packages 1, 2 and 3 are calculated as detailed in paragraphs [A 7.46](#) and ~~A 7.37~~ [A 7.38](#) to A 7.40 above.

A 7.55 All packages except the Final Primary Package are subject to a Final Price Cap relative to the Final Primary Package (package 2). The Final Price Cap limits the Bid Amount for any Package other than package 2 to be no greater than:

- the highest Bid that the Bidder submits for package 2; plus
- the difference in price between package 2 and the package subject to the Final Price Cap in the final Primary Bid Round.

A 7.56 The price of package 2 in the final Primary Bid Round (round 5) was €82m. The prices of the other three packages in the final Primary Bid Round, and the corresponding Final Price Caps are as follows:

- a) The price of package 1 in round 5 was €59m, therefore the highest Bid that the Bidder may submit for package 1 cannot exceed the highest Bid that the Bidder submits for package 2 **minus** €23m (resulting from the difference between €59m and €82m).
- b) The price of package 3 in round 5 was €101m, therefore the highest Bid that the Bidder may submit for package 3 cannot exceed the highest Bid that the Bidder submits for package 2 **plus** €19m (resulting from the difference between €101m and €82m).
- c) The price of package 4 in round 5 was €40m, therefore the highest Bid that the Bidder may submit for package 4 cannot exceed the highest Bid that the Bidder submits for package 2 **minus** €42m (resulting from the difference between €40m and €82m).

A 7.57 The following table provides an overview of the caps that would apply to the Supplementary Bids that the Bidder can submit. In this table, HB(X) stands for the "highest Bid submitted for package X".

Package	Relative cap	Final Price Cap
1	HB(2) – €13m	HB(2) – €23m
2	HB(1) + €26m	NONE
3	HB(2) + €5m	HB(2) + €19m
4	NONE	HB(2) – €42m

A 7.58 Notice that all packages are subject to at least one cap.

A 7.59 Given these caps, which result from bidding for the most preferred package in each Primary Bid Round, the Bidder can reflect its true valuations in its Supplementary Bids. The table below shows the Supplementary Bid Amounts that would reflect the Bidder's valuations and the resulting caps:

Package	Supplementary Bid Amount	Relative cap	Final Price Cap
1	€64m	€88m – €13m = €75m	€88m – €23m = €65m
2	€88m	€64m + €26m = €90m	NONE
3	€92m	€88m + €5m = €93m	€88m + €19m = €107m
4	€45m	NONE	€88m – €42m = €46m

133. ComReg: to All Bidders “Clarification on Multi-Band Spectrum Auction”
(letter dated 3 October 2012)



To all Bidders in the Multi-Band Spectrum Award

3 October 2012

Clarification on Multi-Band Spectrum Award

Dear Bidder

ComReg has received a request for confirmation that on successful logon to the live Electronic Auction System (EAS) on Monday 15 October 2012, all Bidders will have access to information on the aggregate demand for lots in each of Lot Categories 1 to 6 and the Round Price for each Lot Category in the first Primary Bid Round.

ComReg sets out its response to this request as follows:

The EAS will be made available for login on Monday 15 October 2012 from 10:00AM. Information about a Bidder's own bid made on application (shown within the Bid History) and Aggregate Demand for Lots in each of Lot Categories 1 to 6 arising from the Bids made on application (shown on the main screen) will be available from this point onwards through the EAS. Note, however, that the Round Prices applying to the first Primary Bid Round will not be notified until such time as the first Primary Bid Round is scheduled.

As explained in section B.1.2.1 of the EAS User Manual, distributed along with this note, access to information on the Aggregate Demand for Lots in each of Lot Categories 1 to 6 (arising from the bid at reserve price made on application) and the Round Price for each Lot Category in the first Primary Bid Round will be provided when the first Primary Bid Round is scheduled. This will occur prior to the commencement of the first Primary Bid Round on Tuesday 16 October 2012 at 10:00AM. ComReg anticipates scheduling the first Primary Bid Round earlier that morning, but not before 8:00AM, subject to the 15-minute minimum notice period as set out in paragraph 4.62 of the Information Memorandum.

Yours sincerely

A handwritten signature in blue ink, appearing to read 'S. Ritchie', written over a light blue horizontal line.

Dr. Samuel Ritchie