Consultation proposals for the award of 800MHz and 2.6GHz Spectrum packaging and auction design

19 May 2011

Content

- Section 1 – the consultation process and this seminar
- Section 2 – available spectrum and proposed packaging
- Section 3 – competition constraints
- Section 4 – reserve prices
- Section 5 – combinatorial clock auction structure
- Section 6 – mock auction on 27 May

Consultation process

- Consultation on proposals for the award of 800 MHz and 2.6 GHz published on 22 March – closing date for responses 31 May

- Further consultations on technical licence conditions and coexistence with DTT below 790 MHz to be published shortly
  - If stakeholders wish to reserve their position on certain matters until they have seen these consultations we would be happy to receive additional responses on such matters shortly after the publication of these consultations, but would ask that stakeholders still submit their main response by 31 May if at all possible

- Plan to publish a statement in autumn 2011 setting out our decisions, along with an information memorandum and draft auction regulations for consultation

- Auction process expected to begin in Q1 2012

Scope of this seminar

- Main purpose is to explain our proposals for packaging the spectrum and the auction structure
    - Available spectrum in 800 MHz and 2.6 GHz bands – how it might be packaged
    - Competition constraints – how they work
    - Reserve prices – how they might be set
    - Combinatorial clock auction – how it works
- Planned mock auction on 27 May – details of the arrangements

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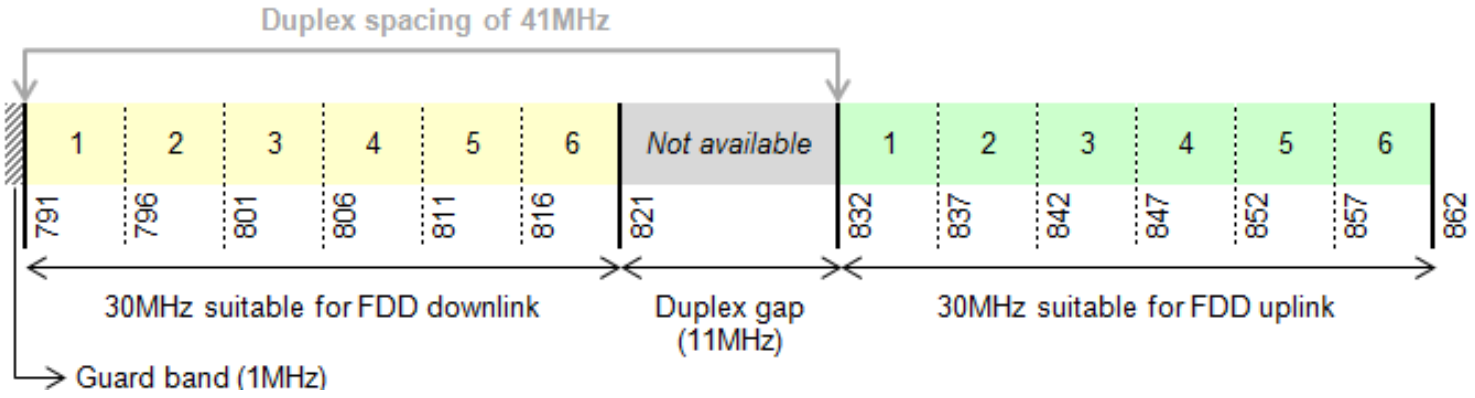
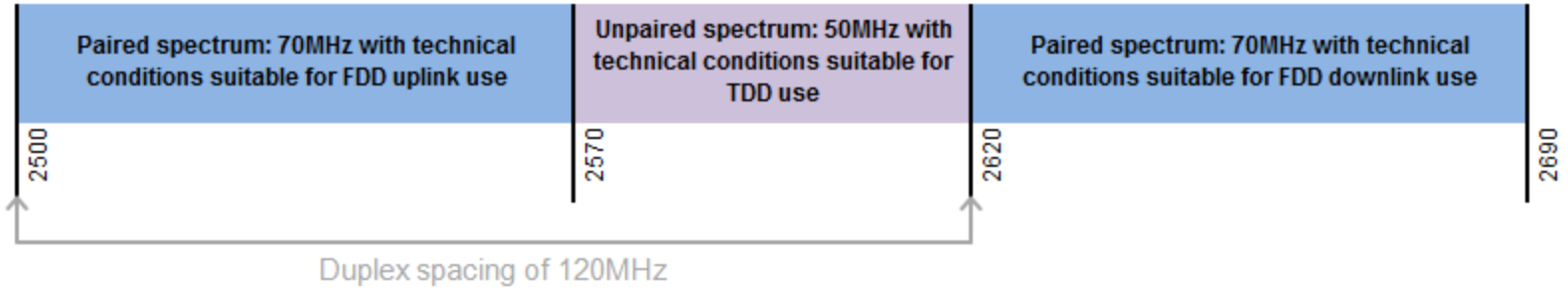
Available spectrum: 800 MHz band plan

- Proposal to use a fixed band plan consistent with EC Decision and with equipment standards
  - 2 x 30 MHz of paired spectrum with 41 MHz duplex spacing



Available spectrum: 2.6 GHz band plan

- Proposal to use a fixed band plan consistent with EC Decision and equipment standards
  - 2 x 70 MHz of paired spectrum with 120 MHz duplex spacing
  - 50 MHz unpaired spectrum in centre gap



Available spectrum: other mobile spectrum

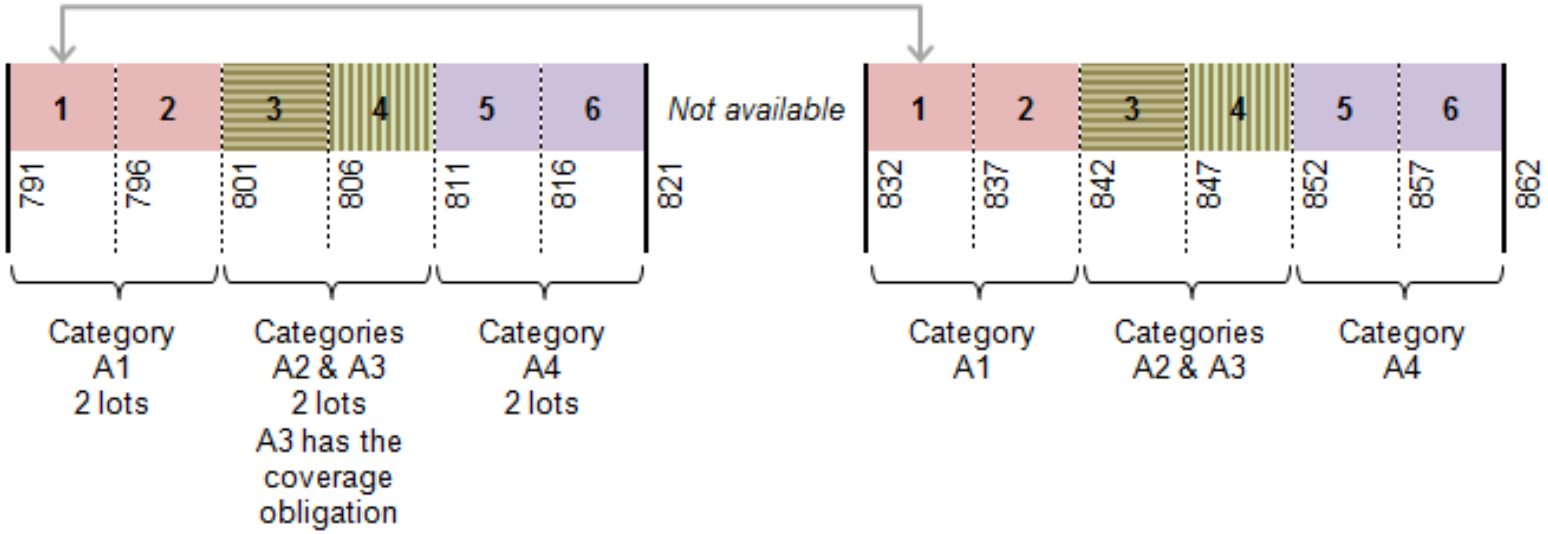
- Everything Everywhere has undertaken to divest 2x15MHz of 1800 MHz spectrum
  - 2x15 MHz at 1721.7-1736.7/1816.7-1831.7 MHz

- This spectrum may be available in the auction
  - If so propose a single lot in its own category

- We are not expecting other spectrum to be available in the auction
  - Not expecting relinquishment of any 900MHz, 1800MHz or 2.1GHz spectrum ahead of the auction
  - Not proposing to permit dynamic relinquishment of 900 MHz,1800 MHz or 2.1GHz spectrum through the auction

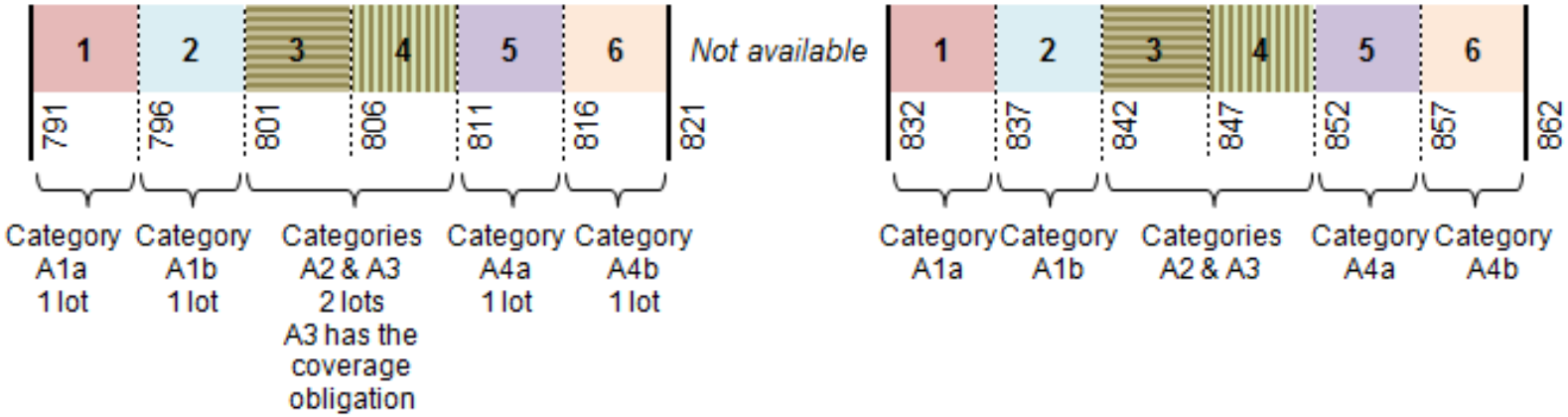
800 MHz packaging proposals in consultation

- Illustration with 4 categories of lots

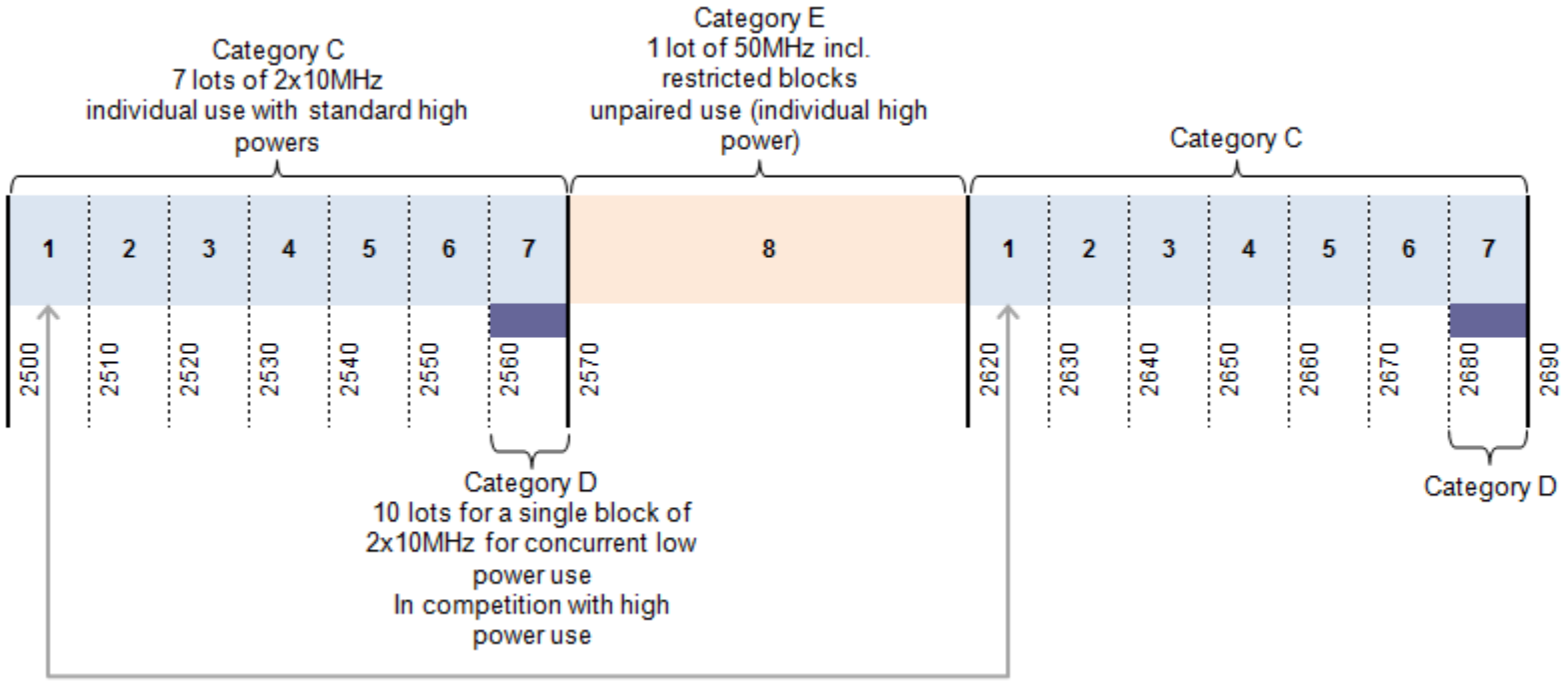


Change to 800 MHz packaging proposals

- 6 categories of lots to help with contiguity requirements
- Proposing to use this updated approach for purpose of mock auction



2.6GHz packaging



- Three main options for accommodating low-power use
  - Low-power users compete with high-power use over 2 x 10 MHz (or 2 x 20 MHz)
  - Reserve 2 x 20 MHz for low-power use
    - 10 MHz for low-power use only + 10 MHz shared with high-power use
  - Reserve 2 x 10 MHz for low-power use only

Proposed eligibility

Lot category	Lot size	Possible eligibility per lot
800MHz A1a, A1b, A2, A3, A4a, A4b	2 x 5 MHz	30
1800 MHz (if available) B	2 x 15 MHz	15
2.6GHz high power C	2 x 10 MHz	10
2.6GHz concurrent low power D	2 x 10 MHz	1
2.6GHz unpaired E	50 MHz	20

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Constraints on auction outcome – minimum portfolios

- 4 competitors to have Minimum Spectrum Portfolio (MSP) after auction subject to demand
- If too few bidders opt-in to compete for guaranteed spectrum then required number of competitors with MSP diminishes accordingly

- Proposed MSPs following the auction

MSP ID	Min. amount of sub-1GHz spectrum	Min. amount of spectrum >1GHz
1	2x5MHz	2x20MHz at 2.6GHz
2	2x5MHz	2x15MHz at 1800MHz
3	2x10MHz	2x10MHz at 1800MHz
4	2x10MHz	2x15MHz at 2.6GHz
5	2x15MHz	0

- Spectrum that does not count towards MSPs
  - 800MHz lots materially affected by DTT protection e.g. A1a & A1b
  - 2.6GHz low power lots
  - 2.6GHz unpaired lot

What the MSPs mean in practice

- O2 and Vodafone already hold an MSP
- Need at least 2 more operators with a minimum portfolio to make up 4+ MSP holders
- EE has holding that covers >1GHz part of MSPs
  - Needs 2 x 5MHz of sub-1GHz to hold an MSP
  - Can opt in to compete to be a guaranteed minimum portfolio holder
- Any other bidder incl. H3G
  - No spectrum that counts towards MSPs
  - Can opt in to compete to be a guaranteed minimum portfolio holder

For EE this means

- 4 specific packages on which EE must place reserve price bids if it decides to compete to be a guaranteed MSP holder

  – Lot A2 – 2 x 5 MHz at 800MHz
  – Lot A3 – 2 x 5 MHz at 800MHz with coverage obligation
  – Lot A4a – 2 x 5MHz at 800MHz
  – Lot A4b – 2 x 5MHz at 800MHz

For H3G and other bidders this means

- 11 specific packages on which they must place reserve price bids if they decide to compete to be a guaranteed MSP holder

MSP ID	Spectrum to win in the auction
1	Lot A2 (2x5MHz at 800MHz) + 2 Lots C (2x20MHz at 2.6GHz) Lot A3 (2x5MHz at 800MHz) + 2 Lots C (2x20MHz at 2.6GHz) Lot A4a (2x5MHz at 800MHz) + 2 Lots C (2x20MHz at 2.6GHz) Lot A4b (2x5MHz at 800MHz) + 2 Lots C (2x20MHz at 2.6GHz)
2 (if lot B available)	Lot A2 (2x5MHz at 800MHz) + Lot B (2x15MHz at 1800MHz) Lot A3 (2x5MHz at 800MHz) + Lot B (2x15MHz at 1800MHz) Lot A4a (2x5MHz at 800MHz) + Lot B (2x15MHz at 1800MHz) Lot A4b (2x5MHz at 800MHz) + Lot B (2x15MHz at 1800MHz)
5	Lots A2, A3 & A4a (2x15MHz at 800MHz) Lots A2, A4a & A4b (2x15MHz at 800MHz) Lots A3, A4a & A4b (2x15MHz at 800MHz)

- Only 3 MSPs included in opt-in stage given packaging proposal at 2.6GHz
  - MSPs 3 and 4 are supersets of 1 and 2

Opted-in bidders guaranteed to win

- 2 opted-in bidders are guaranteed to hold at least one MSP at end of auction
  - If more than 2 opted-in bidders some may not win anything
- Combinations of bids that do not respect this cannot win
- Winning combination of bids
  - Satisfies this condition
  - Has highest total value amongst those that do
- Winning bidders pay at least opportunity cost of their winning bid (subject to the condition)
- Opted-in bidders do not compete with non-opted-in bidders to hold an MSP

Some simplified examples*

- 6 identical (generic) lots at 800MHz (except Example 3)
- 7 identical (generic) lots at 2.6GHz
- Only one MSP
  - 1 lot of 800MHz + 2 lots of 2.6GHz
- 2 bidders need to win an MSP
- Bidders A, B, C opt in
- Bidders X, Y, Z do not

- Example 1: Competition between opted-in bidders to win an MSP
- Example 2: Competition between an opted-in bidder and another bidder for extra spectrum
- Example 3: Competition between all types of bidder for specific lots

*Examples are for illustrative purposes only

Example 1: Competition between opted-in bidders

Bidder	Package	800MHz	2.6GHz	Reserve	Max bid
A	MSP	1	2	£50m	£100m
B	MSP	1	2	£50m	£80m
C	MSP	1	2	£50m	£60m
X	Only bid	2	1	£70m	£150m
Y	Only bid	2	2	£80m	£250m
Z	Only bid	2	2	£80m	£200m

- Bidders A & B out bid Bidder C to win MSP
  - Each will have to pay £60m (highest amount that C was willing to bid)
- Bidders X, Y & Z cannot displace A & B no matter how high they bid – can only compete amongst themselves to win remaining spectrum (in this example Bidders X & Y out bid Bidder Z)

Example 2: Competition for extra spectrum

Bidder	Package	800MHz	2.6GHz	Reserve	Max bid
A	MSP	1	2	£50m	£100m
	MSP+	1	3	£60m	£125m
B	MSP	1	2	£50m	£80m
X	P1	2	0	£60m	£135m
	P1+	2	1	£70m	£150m
Y	Only bid	2	2	£80m	£250m

- Bidder A out bids Bidder X for an extra 2.6GHz lot:
  - Bidder A bid an extra £25m whereas bidder X only bid an extra £15m
  - Bidder A will have to pay £50m + £15m = £65m

Example 3: Competition for specific lots

Bidder	Package	800MHz Normal	800MHz Special	2.6GHz	Reserve	Max bid
Lots available		5	1	7		
A	MSP1	1		2	£50m	£50m
	MSP2		1	2	£50m	£100m
B	MSP1	1		2	£50m	£50m
	MSP2		1	2	£50m	£70m
X	P1	2		1	£70m	£120m
	P2	1	1	1	£70m	£150m
Y	Only bid	2		2	£80m	£250m

- Bidder A out bids Bidders B and X for the 800MHz Special lot:
  - Bidder A bid an extra £50m, Bidder B bid an extra £20m and Bidder X bid an extra £30m
  - Bidder A will have to pay £50m + £30m = £80m

Constraints on bids in the auction – spectrum caps

- Proposal of two caps applying to total holdings
  - pre-existing holdings of relevant spectrum and
  - new holdings that may be won in the auction

Sub-1GHz cap	Overall cap (sub-1GHz + >1GHz)
2 x 27.5MHz	2 x 105 MHz

- 2.1GHz does not count towards caps
- Not all available spectrum would count towards the caps

Lot category	Counts towards sub-1GHz cap	Counts towards overall cap
A1a & A1b 800MHz	Yes	Yes
A2 800MHz	Yes	Yes
A3 800MHz (coverage obligation)	Yes	Yes
A4a & A4b 800MHz	Yes	Yes
B 1800MHz	NO	Yes
C 2.6GHz paired high power	NO	Yes
D 2.6GHz paired concurrent low power	NO	NO
E 2.6GHz unpaired	NO	Yes

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Three options for reserve prices

- Illustrative values

Lot category	Nominal	Higher but not too close to likely value	Approaching likely value
800MHz 2 x 5 MHz	[£100k]	[£30m]	[£200m]
2.6GHz high power 2 x 10 MHz	[£200k]	[£10m]	[£40m]
2.6GHz low power lot 2 x 10 MHz	[£200k]	[£1m]	[£4m]
2.6GHz unpaired lot 50 MHz	[£400k]	[£20m]	[£80m]
1800 MHz lot 2 x 15 MHz	[£300k]	[£15m]	[£60m]

Specific approach to guaranteed spectrum

- Option of charging different price for guaranteed spectrum
  - Separate from issue of reserve prices level more generally

- Not intended that winners of guaranteed spectrum should end up paying a price that is higher than the auction price for non-guaranteed spectrum
  - Intention was to ensure that bidders for guaranteed spectrum face an appropriate price for that spectrum even if demand to win an MSP is weak (to mitigate risk of inefficient auction outcome), not to extract any particular price

- We are considering auction design implications of this option
  - Potentially complex

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Structure of the auction

- Three stages to the auction
  - For bidders that do not hold a minimum spectrum portfolio, option to opt-in to compete to be a guaranteed holder of a minimum portfolio
  - Principal stage – to identify who wins and how much spectrum they win in each category
  - Assignment stage – to identify which exact frequencies the winners receive
    - for those categories where the principal stage has not resolved that already
    - i.e. for 2.6GHz paired lots and possibly for A2/A3 at 800MHz

Opt-in stage

- Bidders that already hold an MSP not involved

- Bidders without an MSP have choice to opt in to compete to be the winner of an MSP
  - Compete to be guaranteed holder of MSP or
  - Compete with all other bidders for any spectrum

- If a bidder opts in
  - Must bid for all the packages it needs to win to hold any of the MSPs
  - Bid at the reserve price

Principal stage

- Two parts
  - Primary bid rounds – an open, multi-round process
    - Bidders bid for a package of lots specifying the number of lots they want within each of available categories
    - Prices per lot increase from round to round
    - One clock per category of lot
    - Main activity rules
      - bidders cannot increase their demand from one round to the next
      - switching between categories is possible
      - spectrum caps apply to each bid
  - Supplementary bids round – a single-round, sealed bid process
    - Bidders can place additional bids consistent with their primary round bids
    - Relative cap rule that links maximum bid on a package to highest bid on package bid on in primary round when bidder last eligible to bid on that size of package

Principal stage – winner and base price determination

- Once we have received all of the supplementary bids we look at all of them, and also at all of the bids made during the primary bid rounds, and identify that combination of bids which:
  - maximises the total amount bid; whilst
  - including at most one bid from each bidder;
  - awarding each lot at most once; and
  - satisfying the competition constraints

- This will be the winning combination of bids, and the bidders that submitted these bids will be the winning bidders

- We will also calculate the ‘base price’ to be paid by each winning bidder using a ‘second-price’ rule

Assignment stage

- A further round that determines which specific frequencies within each band each winning bidder will be assigned if these have not be identified through Principal stage
  - Relevant to paired lots at 2.6GHz and possibly lots A2/A3 at 800MHz
- Auctioneer sets out alternative ways for assigning the spectrum to the winning bidders
- Bidders submit assignment round bids - the amount they would be willing to pay in addition to the base prices determined in the principal stage for each assignment option
  - Could be zero bids if bidder indifferent as to which frequencies they are assigned
- Winning set of assignments is the highest value combination of these bids for each lot category
- Additional price for each bidder is determined using a ‘second-price’ rule
- Final price paid is sum of base price from Principal Stage and additional price for each winning option in Assignment Stage

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Mock auction on 27 May

- If you have not done so already, to participate in the mock auction planned for 27 May you need to register your interest today
- Depending on demand, we may have to limit the number of participants per organisation
- Plan to have up to two auctions
  - At least one in the morning
  - Possibly a second in the afternoon if high number of participants (split across two auctions) or if sufficient interest for a second mock auction
- Bidding over the internet from the location of your choice

- Bidding profiles
  - choose one of 3 starting points regarding pre-existing holdings
    - O2/Vodafone, EE or H3G/entrant
  - choose how you want to bid subject to guidance on maximum valuations / number of primary bid rounds
  - plan to close primary bid rounds by a given time even if excess demand

- Focus on Principal Stage
  - No assignment stage

Thank you

- See the consultation document at http://stakeholders.ofcom.org.uk/consultations/combined-award/?a=0 for more detail on the proposals and the options considered