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Consultation to the Federal Communication Commission ComCom

Auction of Frequency Blocks for the Nationwide Provision of Mobile Telecommunications Services in Switzerland

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COMMENTS OF FTI CONSULTING

I. INTRODUCTION AND SUMMARY

FTI was asked by Sunrise Communications to review the proposed auction rules ("Draft Rules") included in Bakom's Procedures for the Allocation of Available Mobile Frequencies, published in January 2018.

FTI is one of the world's leading corporate advisory and economic consulting firms. Its Auction Consulting unit, led by Dr. David Salant, is acknowledged by peers as one of the leading spectrum auction advisory specialists, having advised on bidding strategy and auction design in over 80 auctions dating back to 1994. Dr. Salant's qualifications are provided in Appendix I.

Clock/SMRA designs are known for having attractive features that promote socially efficient outcomes and a fair, transparent process. However, the clock auction outlined in the Draft Rules deviates quite significantly from prior practice (we highlight nine ways below) and includes untested bidding procedures that are unnecessarily complex, unstable, and risk leading to an inefficient allocation, including unsold blocks. Furthermore, although the Draft Rules put in place a set of spectrum caps, they are not sufficiently constraining to preserve competition in the market and thereby protect consumers, instead permitting the dominant provider to widen the competitive gap in an already highly concentrated market. With these two types of flaws, the proposed format is thus an unproven prototype that will lead to outcomes that jeopardize Bakom's mission. For this reason, we here recommend that Bakom use an adaptation of an existing, proven format, such as the 2015 German multiband auction rules, attached in Appendix II as an example.

The following summarizes the key deficiencies in the Draft Rules, along with recommendations for improving the effectiveness of the auction, with more detailed discussion in the sections that follow.

1. Foremost, the auction rules promote further consolidation in what is already Europe's most concentrated market – Swisscom has market revenue share in excess of 60%, an even higher share of profits, and an HHI exceeding 6500. The Draft Rules enable Swisscom to acquire a package for bands (A,B,C,D,E) of up to (3,1,8,1,7), leaving its rivals to fight over the remaining (3,2,10,0,8) blocks. Swisscom certainly has the

financial power as well as the commercial and strategic incentives to outbid its rivals to achieve such a dominant share of the spectrum. In particular, a package for its competitors that falls short of two blocks of 700 FDD and five blocks of 3500 MHz has only marginal technical or market value, substantially weakening the competitiveness of at least one of the challengers. Essential to remaining a viable competitor to Swisscom in offering 5G, is both Low Frequency ("LF") 700 MHz FDD spectrum required for serving consumers' upload as well as high-capacity download, SDL and the 3500 MHz, spectrum. No amount of download can substitute for inadequate LF uplink coverage (LF is important for servicing consumers' lower power devices) or for inadequate capacity (LF has lower spectral efficiency than high frequency ("HF") which can use more massive MIMO, etc.).

So, unless Swisscom is magnanimous and cedes licenses to its smaller rivals, Sunrise and/or Salt will leave the auction holding a less than viable package of 5G spectrum in the crucial 700 MHz FDD and 3500 MHz bands. Bakom's proposed auction caps will, therefore, have the effect of handicapping one MNO so as to place the industry onto the inevitable path towards consolidation into a two-player market.

2. The rules governing the switching of bids are incomplete, and what is specified is inconsistent with theory and best practice. Past auctions that have either had overly restrictive provisions (limiting opportunities for bidders to arbitrage and rationalize prices) or lacked the necessary switching safeguards to ensure auction stability, have had to be redesigned or have yielded unsatisfactory outcomes, such as larger, more valuable license selling for a discount relative to smaller, less valuable licenses.[1] The current proposal has elements of both these types of flaws, as discussed below. These flaws are numerous and intertwined, and so we advocate against putting piecemeal patches on the current design – which would likely add new flaws – and in favor of reverting to a more tested design.

[1] See Salant 2014 or Bulow, Levin and Milgrom 2017.

3. Bakom's attempt to protect competition by means of an overall 5-block cap in the 700 MHz band for the two strongest bidders, with exit bid provisions, plus a 140 MHz cap in the 3500 MHz band was ill-advised and counter-productive. Recent work[2] suggests that the spectrum caps should be designed to equalize spectrum holdings so as not to preserve or increase market shares of the dominant incumbent. Bakom's proposed cap structure and exit bid provisions allow a third bidder the option to secure one block in Category A at near opening prices; however, both Sunrise and Salt have stated they must have at least two blocks of 700 MHz FDD. Thus, as explained below, it is still very likely one player will get *zero* blocks. Also pointed out below, this cap rule unnecessarily complicates bidding decisions and auction dynamics.

   Our suggested alternative, a staged cap, would implement a two-block cap only if auction prices reach a level at which the largest MNO is deemed to be seeking to foreclose one of its smaller rivals. Starting with a four-block cap at the reserve price (currently set at 16.8 M CHF; however we recommend 8.4 MHz CHF) and dropping the cap to two blocks at, for example, 25.2 M CHF, provides all three MNOs with a fair and equal chance to obtain what they claim to be the necessary two blocks.[3]
4. Supplemental downlink (SDL) spectrum is not a satisfactory alternative for 700 MHz FDD, as i) it does not provide the uplink capacity and superior propagation needed for consumers' inherently low power handsets that will be crucial for IOT and 5G, and ii) none of the 700 MHz SDL blocks and only eight of the 18 blocks of 1400 MHz SDL are currently supported by equipment vendors.
5. For the 3500 MHz band, vendors are standardizing equipment for 100 MHz in bandwidth – anything less leads to underperforming the capability of 5G (as well as increasing the cost per unit of capacity). Consequently, if the leading bidder commits

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[2] Peha, Jon M. "Cellular economies of scale and why disparities in spectrum holdings are detrimental." *Telecommunications Policy* 41.9 (2017): 792-801 and Patrick Rey, and David Salant, "Allocating essential inputs", TSE Working Paper, n. 17-820, February 2018.

[3] See also Cramton, Kwerel, Rosston and Skrzypacz (2011) for a summary of best practices for using caps and set-asides to enhance welfare.

to purchasing the maximum 140 MHz allowed under the cap out of total allocation of 300 MHz, then the second or third bidder will be unable to acquire close to the amount of spectrum that 5G standards recommended for peak performance and so will be competitively disadvantaged.

The preferred approach would be to expand the allocation to 390 MHz, even if some of the additional 90 MHz must be protected for a few weeks per year in a few locations. In this case, a 140 MHz cap ensures that all three MNOs can win at least 100 MHz of spectrum. If it is not possible to expand the allocation, imposing a tighter 100 MHz cap would avert this risk.

6. The activity rules are flawed, as they prevent a bidder returning to a category after a zero bid in that category. If a bidder cannot obtain one preferred package they should be allowed to bid on any other of their preferred packages allowed by caps and their activity points. Submitting a zero bid in one category in one round should not preclude re-bidding in that category in a subsequent round if prices in other categories increase.

7. Applying the maximum allowed price increment, at 50%, would risk overshooting and abruptly forcing bidders to make significant and crucial decisions under the time pressure between one round and the next and, which the draft exit bid mechanism will not properly address. Bakom should use its discretion to limit increments: to 10% early in the auction and smaller increments in later rounds to avoid overshooting and promote convergence.

8. Exit bids, as outlined in the Draft Rules, do not apply except in the last round of the auction (with the exception of the 700 MHz opt-out bid under the cumulative cap rule), so in general they do not mitigate the inefficiencies caused by large price increments and overshooting.

9. Finally, reserve prices are too high, evidenced by the *opening* price of 20 cents per MHz-POP for the 700 MHz FDD being similar to the *final* price in the same band in the 2015 German spectrum auction. Best practice would dictate setting low reserve prices so as not to risk unsold lots if the auction starts at prices above market clearing

levels. The Government's decision to leave NISV unchanged increases the risk that the reserve prices will prove excessive.

Accordingly, FTI recommends reducing the proposed reserve prices by half for each supported band (A, C1, D, and E) and to CHF 0.5 M (approximately 1.2 cents per MHz-POP) for the unsupported bands (B and C2).[4]

Importantly, key shortcomings of the Draft Rules encourage a price spiral up to foreclosure levels, where one or more bidders fail to win the sufficient number of blocks to remain as competitive. The inadequate spectrum caps and exit bid provisions in the 700 MHz FDD band encourage bidders to go for either two or zero blocks in the 700 MHz FDD Category A; further the inclusion of both supported and unsupported 1400 MHz SDL blocks into a single category increases the risk that one or more bidders will end up with inadequate spectrum holdings. Consequently, one of the challengers is unlikely to gain access to the requisite two blocks of 700 MHz FDD, core SDL, and/or sufficient 3500 MHz spectrum, jeopardizing its ability to remain competitively viable, much less narrowing the gap on Swisscom, the dominant provider.

Regarding the auction format as a whole, the current draft includes a mixture of features from a diverse set of auction formats. At best, it is an unproven auction design prototype, which lacks the sufficient testing to ensure the auction process will be stable and likely to converge to an efficient outcome. Based on our detailed evaluation of the elements, however, FTI spectrum auction experts are highly concerned that the various flaws and omissions are likely to steer the auction toward an outcome in which Swisscom wins up to the cap, and one of the two challengers leaves with little insufficient spectrum, much of which is not yet supported, leading to inefficient prices and allocations, perhaps including unsold lots. Furthermore, many of the flaws and omissions have interconnected working; thus, fixing one doesn't improve the situation – they all need to be fixed.

[4] These recommendations are consistent, on a price per MHz-POP basis, with the reservation prices in the 2015 German auction for the 700 MHz and 1500 MHz bands and adjust further for the lower value of unsupported spectrum.

FTI spectrum auction experts believe a more prudent way of ensuring a successful auction would be to take an existing format that has proven to work and make the minor changes necessary to adapt it to this allocation process. There is no need for Switzerland to be the Guinea pig for an untested prototype that has critical flaws (highlighted in this submission) when it could choose one of the several well understood formats that have been proven in multiple auctions. FTI's recommendation is to use an SMRA auction like the 2015 German auction as a starting point.

II. PROPOSED CAPS WOULD JEOPARDIZE MOBILE BROADBAND COMPETITION IN SWITZERLAND

The proposed caps fail to provide the necessary protection to guard against Swisscom obtaining the majority of the core spectrum offered in this auction, leaving the second and third bidders with insufficient spectrum both uplink and downlink to be competitive in providing 5G services.

The Draft Rules institute spectrum caps for certain bands or groups of bands, including three blocks (2x15 MHz) for the 700 MHz FDD band, nine blocks (1x45 MHz) combined for the 700 MHz SDL and 1400 MHz SDL bands, and seven blocks for the 3500 MHz band. In addition, there is a combined, two-bidder cap of five blocks (2x 25 MHz) for the 700 FDD, assuming that there is another bidder with interest for one block (2x5 MHz) for the 700 FDD.

The following summarizes five critical shortcomings identified in the proposed caps:

1. The caps included in the Draft Rules are too high to guarantee Bakom's mandate of ensuring *effective competition* is met. Specifically, the caps would enable Swisscom to increase its overall share of essential spectrum. With significant economies of scale in the provision of mobile services looms the ability for the largest incumbent to widen its advantage in spectrum holdings, increasing its domination and damaging competition post auction.

   To mitigate this risk, FTI proposes that ComCom introduce a staged cap that would allow any player to purchase up to 4 blocks of the 700MHz if there is little competition for those blocks, but would tighten to 2 blocks once a fair price is reached. The auction thereby determines via bids how tight the caps need to be. This way, competition policy goals would be satisfied and spectrum would be awarded at fair prices.

A second alternative is to use a Staged Auction, which includes a Base Phase and a Bonus Phase. In the Base Phase, bidders can bid for 3 blocks with a 1 block cap. In the Bonus Phase, the 3 remaining blocks are auctioned with a 2 block cap; however, once the trigger price for the second block is reached, bids would be capped at 1 block.[5]

2. If able to obtain only one block of 700 MHz FDD, Sunrise would be competitively impaired. Likewise, Salt has also stated in the media that it needs two blocks of 700 MHz FDD. Post auction, investor perception of this impairment may well impact the ability to finance 5G investments, further degrading effective competition.

3. The caps on the number of SDL blocks also puts at risk Bakom's mandate of ensuring effective competition. If the eight vendor-supported ("core") 1400 MHz SDL blocks were acquired by Swisscom, Sunrise would be delayed in utilizing this band until equipment supporting non-core bands becomes available. Currently, Switzerland is the only market intending to license this non-core part of the band, and so there is uncertainty as to whether and, if so, when such equipment might become available. To mitigate this risk, ComCom should split the SDL blocks into three categories, consisting of (i) 700 MHz SDL (unsupported), (ii) 1400 MHz SDL core (supported), and (iii) 1400 MHz SDL extended (unsupported). There should also be a cap on how many 1400 MHz SDL core (supported) blocks one bidder may win that would allow all bidders to deploy services on the band in a timely fashion.

4. The proposed allocation of 3500 MHz TDD spectrum is limited to 300 MHz. If one bidder were able to obtain the maximum allowed 140 MHz, and another bidder obtains the 100 MHz required for full performance of 5G,[6] then the third bidder, winning only 60 MHz, would be significantly disadvantaged. It would be beneficial

[5] The Staged Auction has the same effect as a floor of one block, but in addition resolves all impairment risks while still allowing for a simple auction format. It also avoids unallocated blocks (remaining blocks auctioned separately with the price beginning at the trigger price), thereby ensuring efficient use of all frequencies.

[6] See "5G Spectrum Public Policy Position," Huawei, 2017, and see Section VII for further discussion.

for supporting the 5G digitalization of Switzerland to allocate 390 MHz TDD, as mentioned in the summer consultation paper. Only then could a cap of 140 MHz be maintained without creating a significant disadvantage.[7] Alternatively, if only 300 MHz is available, the cap should be reduced to 100 MHz to mitigate this risk.

5. Bakom's proposed five-block cumulative cap applied to any two bidders in the 700 MHz band ensures no less uneven division of the 700 MHz FDD spectrum than a 3-2-1 allocation, provided the value of one block justifies its deployment. However, the value of the first block tends to have much less than half the value of two blocks. The combined value to two bidders winning all 6 700 MHz FDD blocks would therefore exceed the value of it being shared 3:2:1; hence, the overall cap approach still encourages a two-winner outcome. Our example provided below illustrates why the two-winner outcome could indeed be more likely.

Further, the application process to join the auction does not request information from bidders about their minimum essential spectrum packages. FTI suggests that, in the application process bidders are asked for their minimum essential spectrum package and separately asked for their starting eligibility points. Such a request would inform Bakom ex ante about the likelihood that bidders could obtain feasible packages, whether or not it is necessary to conduct an auction, and whether the extent of excess demand will tend to drive very high prices. If one of the challengers were to indicate that one block of 700 MHz FDD would be acceptable, then Bakom could proceed with a five block cap knowing that a 3:2:1 outcome in that band is likely. On the other hand, if none of the challengers indicate a willingness to purchase only one block of Category A, then Bakom will need to adopt a two block cap, a stage cap, or accept consolidation in the market.

[7] Specifically, the least balanced outcome would be 140/140/110 which would not create a significant disadvantage post auction for any bidder.

III. CUMULATIVE CAP PROVISION MAY SUPPRESS SMALLER BIDDERS' DEMAND FOR 700 MHZ FDD

Despite Bakom's intent to provide bidders with the option to secure a single block of 700 MHz FDD spectrum at an affordable price, FTI believes the benefits of cumulative cap mechanism is not worth the cost (i.e., bidding complexity) and does little to address the risk that a small bidder is shut out or attains an inefficient allocation. Specifically, the cumulative cap unnecessarily puts the smaller bidder into a decision-making quandary, requiring an early choice (prior to the price discovery process) between conceding early-on for a low-priced, low-valued single block or to compete for the targeted two-block outcome with the risk of being priced out and winning nothing.

According to Section 3.6, a cumulative cap will be implemented after the first round in which there are only two bidders submitting non-zero clock bids in the Category A and at least one bidder submits an exit bid for a single block. This, in effect, partitions and reserves one block for the exit-bidder and freezes the price for that block at a level no higher than the clock price in the round in which the exit bid was submitted. Meanwhile, the price of the unreserved blocks will continue to increase as long as there is excess demand for only the five remaining blocks. Thus, if the two active bidders were to place three blocks each, prices would continue to increase up to their financial limits.

The cumulative cap was intended to provide smaller bidders with an alternative, more affordable option for attaining a single block of 700 MHz FDD. This provision shifts the incentives of a small bidder and creates the following dilemma: By settling for one block quickly through this protective exit bid, a bidder can guarantee itself a low price for one unit, no matter what the other bidders do. In contrast, bidding for two block for multiple rounds with the goal of acquiring a the more efficient package creates the risk that prices reach the level at which buying just one block as a fall back becomes unprofitable (one block necessarily becomes unprofitable before two block does because the value of one lost is less than half the value of two block). Thus, competing for two block tends to result in a "go for broke" situation in which the weakest bidder ultimately must drop demand to zero to avoid incurring a loss.

The risk of getting shut out can be illustrated with a simple example, shown in Appendix III – Example 1. It appears very likely, based on the views expressed by the operators on the need for two blocks and on our own analysis that each are likely to try to compete for two blocks, and one will end up with none. In either case, this cumulative cap is seen to create the dilemma of whether to drop to a single block and concede two blocks to the rival in an early round (while the price is low) without the benefit of price discovery.

IV. DRAFT AUCTION FORMAT IS SUSCEPTIBLE TO OVERSHOOTING, UNNECESSARILY RESULTING IN UNSOLD BLOCKS

High reserve prices in certain bands, the continued NIVS restrictions, and certain aspects of the proposed clock round procedures will increase the number of blocks of spectrum going unsold, the result of either i) receiving no bids at all or ii) overshooting due to auction dynamics during the clock phase, or iii) overshooting due to excessive price increments.

The risk of having a large number of block going unsold is problematic, not only because it is inefficient,[8] but also because it creates uncertainty about how, when, and at what prices block will be sold in the future. That, in turn, affects demand during the current auction. Given these multiple risks, Bakom must address the issues with these mechanisms and clarify what will happen with unsold block.

i) Unsold blocks due to excessive reserve prices

Ordinarily, it is natural for block to receive no bids and go unsold if bidders' incremental values for the block are less than the auctioneer's reserve prices. However, it is inefficient to have block go unsold because reserve prices are set artificially high, which is more likely now that the NIVS limitations remain and unduly restrict the use and therefore value of the spectrum. The reserve price is also likely too high for SDL, as the value of the SDL band is diluted due to

[8] Inefficiencies emanate from the delays in deployment of the spectrum, which does not promote the leading positon of Switzerland with respect to digitalization and the related spillover for the Swiss economy.

discounting for the uncertainty arising from combining the unsupported SDL frequencies with the core spectrum.

ii) Unsold blocks due to auction dynamics

Further, as explained below, best practices in auction design prevent or discourage bidders from reducing package bids to the extent that it causes excess supply. The proposed clock round format in the Draft Rules lacks these customary restrictions or consequences on bidding. Moreover, the inefficient way in which "exit bids" are applied does too little to address the problem (as discussed below). Consequently, in this auction, there is an unnecessarily high risk of overshooting arising from non-straightforward bidding (such as from changes in bidding strategies, financial constraints, and other factors) or multiple block reductions or shifts in bids resulting from excessive price increments.

The source of the problem is in provision 3.4.7 in the Draft Rules, which states that, each round, bidders are "free to specify" the number of blocks in each category, provided that the bid complies with spectrum caps and the eligibility limits. Absent explicit restrictions on the submission or processing of clock bids that would limit the extent to which bidders can reduce demand or switch out from one band to another, this could result in excess supply during the clock phase and ultimately unsold blocks at the conclusion of the auction. Moreover, neither does the proposed format put in place *consequences* to the bidder for reductions that result in unallocated blocks (besides any reductions in eligibility that apply).

These clock rules contrast with auction practice over the last 20+ years, in which most of the commonly used spectrum auction formats have placed restrictions or incentives that prevent blocks from going unsold once bidders have expressed demand for them.

- In a standard SMRA, in each round, the auctioneer assigns a standing high bidder to each block on which there has been at least one bid during the auction, and the bidder cannot move these bids elsewhere unless and until he is replaced by another standing high bidder

who has topped his bid.[9]

- While commonly used clock auction formats do give bidders full flexibility to *submit* bids that reduce demand in a band or switch to another band, most still restrict the *processing* of bids to ensure that aggregate demand does not fall below supply (see the 2017 US Incentive Auction)
- Alternatively, clock auctions make bid reductions (along with all other bids) consequential, by including them in the final winner determination and pricing (see any of the recent Combinatorial Clock Auctions or Combinatorial Multiple Round Auctions).[10]

In sum, these commonly used auction formats are less likely to produce unsold blocks due to auction dynamics.

iii) Overshooting due to excessive price increments

In its Draft Rules, Bakom *does* provide for the use of exit bids, a mechanism that was designed to mitigate one of the potential sources of overshooting – large price increments that cause demand reductions to fall below the available supply. In general, exit bids allow bidders who intend to reduce demand by one or more blocks from the previous round to indicate the precise intermediate price levels (between the current and last round's clock prices) at which each reduction in demand would have been triggered. Using this information, the exit bid mechanism serves to avoid overshooting in certain cases by, in effect, reducing the price increment just enough to prevent aggregate demand from falling below the available supply.

Although exit bids, in theory, help to mitigate one of the sources of overshooting, the variant of this mechanism included in the Draft Rules is highly inefficient because (except for the

[9] In some designs bidders are allowed to withdraw from a limited number of standing high bids, but they are still held financially responsible for the full amount of their bid should the license go unsold.
[10] In a Combinatorial Clock, it is not uncommon for there to be overshooting in certain bands; however, the winner determination algorithm is designed to award some or all of the vacant blocks if the bids submitted during the clock phase indicate doing so would increase total surplus.

cumulative cap provision in Category A) they are applied only if occurring in the final round of the clock phase. As per provision 3.4.12, all exit bids submitted prior to the last clock round simply "don't count." To see the inefficiency this creates, consider the following example:

- Suppose, in Round X, the price per block for Band E is CHF 10 million and aggregate demand is 16, for an excess demand of 1 block, and in Round X+1 two bidders each submit clock bids that reduce demand by one block, resulting in the potential overshooting by one block.
- Now consider that, if either of the bidders were to also submit an exit bid indicating the highest price at which its demand would have remained unchanged from the prior round, and the exit bid was honored, then the overshooting would be avoided.
- However, if in Round X+1 there were still excess demand in any other band (say Band D), then the exit bid will be disregarded because the clock auction failed to close in the same round as the exit bid was placed.
- Thus, an unfortunate implication is that the only situation in which overshooting that has occurred in various bands can be fully resolved using exit bids is in the seemingly unlikely scenario that all of the overshooting occurred in exactly the same round – in particular the round in which the clock phase closes. Otherwise, exit bids that would otherwise resolve the overshooting would be disregarded.

Exit bids provide the most utility when increments are large, e.g., more than 5% or 10%, depending on the stage of the auction. In cases in which increments are small, exit bids are less essential, as the small increments limits the risk and the harm from overshooting. [11] (See Section VIII for further discussion of price increments.)[12]

[11] As long as price increments are kept at moderate levels, ranging between 1% and 10%, the risk of overshooting is reduced, and there is little need to install exit bids into the auction. Removing exit bids would help to simplify the auction.

[12] If Bakom intended for exit bids to count toward round activity and allow resubmission of exit bids in subsequent rounds, , the risk of unsold blocks is slightly reduced.

V. DRAFT RULES' TREATMENT OF NON-ZERO BIDS IN A CATEGORY IS INCONSISTENT WITH RULE 3.4.7 AND PRECLUDES SINCERE BIDDING

Bakom's unusual rule precluding ever bidding again in a band in which a bidder has previously placed a zero bid, prevents bidders from bidding straightforwardly and prevents efficient outcomes.

The Draft Rules contain a special provision (3.5.3) within the Activity Rule section that states that a bidder who has submitted a zero bid in a category can no longer bid in the same category later in the clock phase. This rule is unusual because, unlike most if not all auctions that contain activity rules, the provision applies limits on future bids for a particular band only, based on the number of blocks previously placed in that band – and only in the case of a zero bid. Typically, activity limitations apply to total points bid across bands, because they are intended to encourage bidders to maintain activity throughout the auction and not to limit the flexibility to switch.[13]

As such, it is also inconsistent with Bakom's wish to enable bidders to bid for packages. For example, a bidder might find two packages of equal interest, say (2,0,6,0,5) versus (2,3,3,0,5) (considering B and C licenses to be substitutes). As prices rise on the C category, the bidder might want to switch from the first to the second package. Provision 3.5.3 of the current draft rules prevents that, so instead of being able to continue to bid on a package they want, they are forced to reduce demand in category C to bid for sub-optimal packages, such as (2,0,5,0,5), then (2,0,4,0,5).

To "work-around" this flaw the only way the rules allow a bidder to maintain such flexibility is to submit bids that maintain at least one block in each category of interest. However, this would create other problems, including a false indication of continued demand as well as the risk of an unexpected end to the auction and so being trapped with a low-value or even a useless, isolated single block. This would be contrary to ComCom's duty to ensure efficient use of spectrum.

[13] Note that reasonable band-specific limitations can be addressed through spectrum caps.

Provision 3.5.3 also appears to contradict provision 3.4.7, which indicates a bidder is free to specify the number of blocks demanded in each category so long as the bid complies with the overall activity requirement as well as the spectrum caps. No mention is made of any exceptions in the case of a previous zero bid in a particular category.[14]

That the Draft Rules state the zero-bid provision in 3.5.3 is implied by the Activity Rule (3.5.2), *which it is clearly not*, suggests that this portion of 3.5.3 is an unintended misprint.

Furthermore, provision 3.5.3 renders moot the provision in the Cumulative Cap (in 3.6.2) that states that the "provisional surcharge expires if, in the further course of the clock phase more than two bidders submit clock bids containing blocks in category A." This statement is moot because, were the zero-bid provision in effect, no new bidders (other the original "two bidders") having previously bid zero in that band would have been allowed to submit clock bids containing blocks in category A.

FTI emphasizes that the zero-bid provision in 3.5.3 causes distortions in bidding. The ability to switch bids in an auction is paramount to efficiency; it is the very reason for having a simultaneous multiple round format, rather than separate auctions for each category. In particular, bidders should be afforded the flexibility to switch bids between categories as relative prices change, even if that results in temporarily placing a zero bid in a particular category and then rebidding in a subsequent round.

Thus, FTI proposes striking out the phrases in parentheses from provision 3.5.3, in which case the second sentence will simply say "This also means that a bidder who submitted a zero bid, over the further course of the clock stage, can no longer submit any bids," with the understanding that "zero bid" means bidding zero on all blocks (i.e., not bidding at all).

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[14] Section 3.4.5 treats the case "zero bid" as a bid for zero blocks in all categories (not just a single category). In the context of this definition of a zero bid, the notion that a bidder cannot thereafter place a non-zero bid is, in fact, consistent with the Activity Rule (3.5.2)

VI. CONCEALING AGGREGATE DEMAND INFORMATION PROMOTES INEFFICIENT BIDDING BEHAVIOR

The information supplied to bidders at the end of a round – namely, informing bidders whether there is surplus demand or supply in each category, but not how much excess there is in each category – is insufficient to promote efficient convergence of the auction to a satisfactory outcome.

Bidding in most spectrum auctions is complex in that it typically requires operators to choose among a large number of alternative combinations of spectrum, many of which have materially different implications for how they build their network and the types of services they can provide to their customers. It is well understood that using a simultaneous multiple-round auction format aids price discovery and helps bidders assemble desirable packages of spectrum.[15] As part of the discovery process, the aggregate quantity of demand, by product, is an important indicator that bidders use in an auction to gauge the relative levels of competitiveness by band.

As part of the process of adjusting demand and shifting packages in response to price changes, over the course of the clock phase, bidders consider relative levels of demand, not just current price levels, as indicators of how expensive different blocks and packages are likely to become. To draw a parallel, when prospective home buyers are visiting houses for sale, before they decide which house to make a binding offer on, they take into account how many other visitors are viewing each house as the popularity is an indicator of how much further price escalation might occur.

If demand information is suppressed, then bidders will find it more difficult to anticipate price dynamics and therefore will be less equipped to make informed choices throughout the clock

[15] Price discovery refers to process of determining the price of an asset through the interactions of buyers and sellers (or bidders) in marketplace (auction). See McMillan, John. "Selling Spectrum Rights." Journal of Economic Perspectives 8.3 (1994): 145-162 and Milgrom (2004)., Salant, David, “A Primer on Auction Design, Management and Strategy.” MIT Press (2014) contains a discussion of this issue.

phase. Furthermore, without such demand information, bidders are incentivized to experiment by altering bids from round to round to try to elicit information on the extent of aggregate demand for different products through observing the effect on price changes. Such experimentation are rational attempts by bidders to discern valuable information, yet can lead to inefficient outcomes.

While limiting the information provided to bidders between rounds may be intended to reduce the potential for bidders to coordinate, doing so comes at a cost to efficiency. A multiple round auction format is usually selected over a sealed bid auction format because it makes choices among spectrum packages simpler and helps bidders narrow their focus on a smaller, more realistic set of packages given the prices and quantities it has observed during prior rounds.

The more information that is suppressed, the less clarity bidders attain during the clock rounds, making it more difficult to navigate among intended targets. This issue was evident in the 2013 Austrian 4G auction, in which, by rule, aggregate demand was not disclosed following each round. Midway through auction, however, RTR reversed course and decided to begin disclosing aggregate demand for each band to facilitate the clearing of the auction.

FTI's recommendation is that Bakom report aggregate demand by category after each round.

VII. 1400 MHZ CATEGORY "C" BLOCKS ARE NOT UNIFORM AND SHOULD BE SPLIT INTO SEPARATE SUB CATEGORIES.

Combining supported and unsupported 1400 MHz SDL blocks in a single category creates an exposure problem, hence distorts value discovery

The 1400 MHz C Band contains a mixture of frequency blocks that have been allocated in other countries and are currently supported by equipment vendors and frequency blocks that have not previously been deployed and for which the timing of vendor support is highly uncertain. If these two types are included into a single category as generic , blocks, it plays havoc with the bidding process, forcing bidders to either getting stuck overpaying for the unsupported blocks or cautiously dropping out of the bidding early, even if their valuations support paying the market price for the supported blocks. If Bakom intends to use a generic block format, it must split out

the supported and unsupported blocks into separate categories in order for the auction to work efficiently.

1) The 1400 MHz SDL blocks are not all similar and should not be included in one generic category.

In principle, FTI agrees that the generic block treatment is appropriate where the blocks are interchangeable. If the specific frequency location within the band has little to no impact on value, then it is practical to auction the spectrum as generic blocks, as is proposed in the Draft Rules. When this is the case, by using a generic block format in the clock phase, bidders have the simpler task of specifying the total quantity of blocks demanded, rather than having to decide among multiple different combinations of frequencies within the band, as must be done in the concrete- block t format. Furthermore, a single unit price is assigned for all blocks within the category, so that prices increase simultaneously and uniformly for each block instead of in an alternating fashion, as is often the case when using concrete blocks; hence, the auction converges on a satisfactory outcome more quickly.

Unfortunately, in the 1400 MHz SDL "C" category, blocks are not of equal value, because the 1400 SDL core band consisting of eight blocks between 1452 and 1492 MHz is currently supported by terminals and has been put in commercial use,[16] while the 1400 SDL outer bands, consisting of the five blocks on each side of the core eight, are not currently supported by terminals. It is our understanding that Switzerland will be the first country that will auction the 1400 SDL outer bands, and few if any other countries are currently planning to allocate these bands. Blocks in these outer bands are substantially less valuable because of the delay and uncertainty around the timing of equipment availability and therefore the ability to deploy service.

[16] See Italy raises EUR462m selling L-Band spectrum," 11 Sep 2015 and "TIM is the first in Europe to launch 4.5G up to 500 Mbps in Rome, Palermo and Sanremo," 15, Dec 2016. Also see "FTE to Utilize L-Band Frequency," 25 Feb 2013.

Conducting an auction with generic blocks when blocks have different values creates an *exposure problem*, in which bidders must decide whether or not to take the risk of staying in bidding if the price exceeds the value of the lesser-valued blocks. The risk stems from uncertainty about what price would prevail for the more valuable core frequencies in the assignment round. Unlike an auction of concrete blocks, this uncertainty often cannot be sorted out during the clock phase from bidding on generic blocks. Thus, unless a bidder is able to perfectly forecast the outcome of the assignment round, it may have to choose between dropping out early or continuing to bid and facing the risk of paying more than its value of the blocks – either choice may result in the less efficient outcome. See Appendix III – Example 2 for an illustration of why inefficient outcomes occur from the Clock and Assignment phase bidding in this case. On the other hand, with concrete blocks, the bidder does not face this exposure risk, because it can place different bids for each frequency during the clock round, thereby conditioning each bid on the quality of the respective block.

Thus, FTI strongly recommends splitting the 1400 MHz band into two sub categories C1 and C2, which would include the eight core blocks and 10 non-core blocks, respectively.[17] This restores the required level of value-uniformity within each bidding category to avoid bidder exposure problem. Within this structure, the application of a 3 block cap in Category C1 would ensure that all bidders are able to secure at least two blocks.

2) Without splitting C blocks into C1 and C2, the supported 1400 MHz SDL blocks will not be a reliable option for a bidder winning one or no 700 MHz FDD blocks

While the combined cap in the 700 MHz FDD band gives a bidder with limited resources the potential to win a single block near the starting price, the fact that all blocks in the 1400 MHz band are generic, with only 8 of the 18 blocks being supported with available equipment, and the fact that one bidder is permitted to win up to 9 blocks, means that a strong bidder who wins three

[17] The two categories, core and non-core, could be considered together in the Assignment Phase, to allow bidders to express preferences for contiguous blocks.

700 MHz FDD blocks can also block a weaker bidder from obtaining any of the supported 1400 MHz SDL blocks.[18]

VIII. THE AUCTIONEER SHOULD REFRAIN FROM USING LARGE PRICE INCREMENTS

The "up to 50%" price increments are excessive, make overshooting and unsold blocks much more likely and put unnecessary pressure on bidders to make abrupt decisions across multiple bands.

FTI understands that Bakom seeks to ensure a proper and expeditious auction; however, we encourage the auctioneer not to utilize price increases outside the range of 1% to 10% (certainly not near the 50% limit proposed in the Draft Rules). As mentioned above, the use of large increments increases the likelihood of multiple unit demand reductions in a single round, making overshooting and unsold blocks much more likely. Although providing bidders with the option to place exit bids serves as a safety net, the protection is limited because in many situations (including any round in which every band does not clear simultaneously), the current draft rules indicate that the exit bids won't be applied. Furthermore, even when applicable, exit bids are designed for filling in demand information independently for each band. They don't help bidders to express price thresholds jointly for two or more bands, in situations such as when bidders are reaching spending limits and they need to reduce in one band but not necessarily both simultaneously. Also, exit bids do not enable bidders to switch efficiently between bands at intermediate prices.

In sum, large price increments tend to impede a bidder's ability to manage its objectives late in the auction and tend to cause overshooting; meanwhile the protection received from submitted exit bids, in the currently proposed format, is very limited. To minimize a bidder's risks and ensure a stable close of the auction, the best and most common practice is to maintain moderate

[18] Furthermore, the 700 MHz SDL blocks (Category B) are also not supported.

price increments. Reducing the price increment to the range of 1% to 10% will also eliminate the need for exit bids, substantially reducing the complexity of this design, and so its risks.

The outcome of the auction is also strategically and economically one of the most important decisions and has to respect corporate governance procedures. This can be seriously compromised if a 50% round increment abruptly compresses such decision making into a very short period.

IX. CONCLUSION AND RECOMMENDATIONS

FTI appreciates the opportunity to provide our expert input on an early draft of the auction rules.

FTI experts have highlighted nine key deficiencies in the proposed draft rules:

1. Most significantly, the proposed caps would jeopardize mobile broadband competition in Switzerland.
2. Draft auction format is susceptible to overshooting.
3. Cumulative cap provision may suppress smaller bidders' demand for 700 MHz FDD, or otherwise cause them to risk winning no blocks at all in the band.
4. Treatment of non-zero bids in a category is inconsistent with different sections of the rules and precludes sincere bidding.
5. The exit bid provisions are inefficiently specified and do little to safeguard against the risk of overshooting in cases where price increments are too high.
6. End of round processing is not specified.
7. Concealing aggregate demand information promotes inefficient bidding behavior and was found to be detrimental to clock phase bidding in a large prior auction.
8. 1400 MHz "C" band blocks are not uniform and should not be auctioned as one category.
9. The reserve prices are too high, given auction benchmarks and the continuing imposition of the NISV.

All these flaws must be addressed together – a piecemeal fix will compound rather than cure the problem. Even then, this patched prototype would still need to go through further vetting, consultation, testing, and extensive simulations before it can be accepted for operational use.

In closing, FTI's expert opinion leads to the following recommendations:

i) Introduce a staged Cap for 700 MHz Band and reduce the cap in Category E to 100 MHz

As explained in Section III, the cumulative cap makes the early settlement dilemma for smaller bidders even more pronounced: a bidder either has to give up on winning two blocks of 700 MHz FDD at the start of the auction or risk getting none, as prices escalate. As such, FTI believes that a "staged cap" would provide a more effective solution for this problem.

Staged caps also balance the requirement, and desirability, for a market mechanism for allocating blocks with the mandate to ensure effective competition where effective competition might only be achievable when caps are so tight as to eliminate excess demand in one or more key categories.

Bakom's mandate is to ensure effective competition; at the same time, Bakom might want to avoid caps that are so tight as to eliminate excess demand in one or more key categories. Staged caps provide a market mechanism which balances these two requirements. Bakom could set the "trigger price" sufficiently high that only bidders with a strong need for the two blocks FDD will continue to compete for it.

ii) Choose and then adapt a proven auction format rather than trying to fix the multiple flaws in the proposed, untested, and prototype auction format

The proposed auction format has a number of "novel" elements, such that it is tantamount to an unproven prototype. It usually takes a multi-year vetting process by leading academics, then testing and simulations under all possible auction dynamics before a prototype can be accepted as "flight worthy."

Furthermore, many of the flaws and omissions of the proposed design have interconnected working; thus, fixing one doesn't improve the situation – they all need to be fixed. Then the fixes should be vetted.

The safest way of avoiding this danger is to take an existing auction that has proven to work and make the minor changes necessary to adapt it to this allocation process.

In particular FTI's expert opinion is to suggest using the 2015 German auction blueprint. FTI notes that, included in the German rules, and common in SMRA and clock auctions, is the request for bidders to submit information about minimum spectrum requirements in their applications. Incorporating this element in the Swiss auction would permit Bakom to re-evaluate its options should no bidder indicate that it would be willing to accept only one block of 700 MHz FDD at any positive price. FTI has highlighted nine divergences from best practice discussed here – these are obvious and seriously significant concerns that are likely to undermine the integrity of the process. The safest recourse is to revert to a tested format.

APPENDIX I

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Professional Experience

2007 –	Professor Associé/Invité and Associated Researcher Toulouse School of Economics
2008 – 2011, 2017-	Senior Managing Director, FTI Consulting
2006 –	Co-Founder, Auction Technologies, Inc.
2013 – 2015	Managing Director Alvarez and Marsal
2003 –	Adjunct Senior Research Scholar, Columbia Institute for Tele-Information, Columbia University
2004 –	Research Professor, Center for Research in Wireless Communications, Clemson University
2006 – 2008	Senior Consultant, CRA International
2003 – 2004	Co-CEO and Founder, Optimal Markets, Inc.
2000 – 2003	Senior Vice President, NERA
2000	Special Consultant, NERA
1999 – 2002	President and Founder, Alkera Inc d/b/a Optimal Auctions.
1999– 2000	Managing Director, Navigant Consulting Incorporated/LECG, Incorporated
1998–1999	Principal, LECG, Incorporated
1996–1998	Director, LECG, Incorporated
1995–1996	Principal, Charles River Associates Incorporated
1993–1995	Principal Member Technical Staff, GTE Laboratories Incorporated
1991–1993	Research Associate, Department of Economics, Boston University
1987–1993	Senior Member Technical Staff, GTE Laboratories Incorporated
1983–1987	Assistant Professor, Department of Economics, VPI
1979–1983	Assistant Professor, Department of Economics, SUNY at Buffalo

Education

Ph.D., (Economics) University of Rochester, February, 1981.

M.A., (Economics) University of Rochester, May, 1978.

A.B., (Economics and Mathematics) Washington University, Magna Cum Laude, May, 1975.

Publications

Book

"A Primer on Auction Design, Management and Strategy," MIT Press (2014).

Refereed Publications

"Resale Price Maintenance Post Leegin: A Model of RPM Incentives, (with William Comanor), *Review of Industrial Organization* Vol. 50, No. 2 (March 2017): 169-79.

"Evolving Technologies and Standards Regulation," with Luis Cabral, *International Journal of Industrial Organization,* Vol. 36 (September, 2014):48-56.

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"A New Look at Public Utility Regulation Through a Revolving Door." Chapter 9 in Michael Crew (ed.), *Economic Innovations in Public Utility Regulation*. Kluwer Academic Publishers, 1992.

"Price Setting in Professional Team Sports." Chapter 5 in Paul M. Sommers (ed.), *Diamonds Are Forever: The Business of Baseball*. The Brookings Institution, 1992.

OTHER PAPERS

"Allocating Essential Inputs," with Patrick Rey, 2016 (revised 2018).

"The Effects of Standard Setting Organization Policy on Investment and Welfare," with Paul Seabright, 2014.

"Auction Design for Capacity Markets," with Robert Stoddard, June, 2008.

"Sequential Auctions and Auction Revenue," (with Luis Cabral) 2016.

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EDITORIAL AND REFEREE ACTIVITY

Dr. Salant is the guest editor of two special issues of the *Journal of Regulatory Economics* on Auctions and Regulation. In addition, Dr. Salant has served as a referee for *American Economic Review, Canadian Journal of Economics, Contemporary Policy Issues. Econometrica, Economic Inquiry, The Economic Journal, Games and Economic Behavior, IEEE/ACM Transactions on Networking, International Economic Review, Journal of Political Economy, Journal of Economics and Management Strategy, Journal of Regulatory Economics, Journal of Macroeconomics,* National Science Foundation, and the *RAND Journal of Economics*

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Organized Conferences on

"Spectrum Auction Design, Experience and Post-Auction Market Structure," Columbia University, CITI, June 2014.

"Smart Radio," Center for Tele Information, Columbia University, joint with Clemson Center for Research in Wireless Communications and Virginia Tech's College of Engineering, http://www4.gsb.columbia.edu/citi/events/eventsarchive/smartradio.

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"After the Closing of the Spectrum Frontier: What Spectrum Models Work Best and When," Center for Tele Information, Columbia University, 2004, http://www4.gsb.columbia.edu/citi/events/eventsarchive/spectrumfrontier.

HONORS, SCHOLARSHIPS, AND FELLOWSHIPS

Phi Beta Kappa, 1975
Rush Rhees Fellowship, 1975–1978
University Fellowship, 1975–1979

COURSES TAUGHT

Auction Theory and Practice (graduate)
Microeconomics (graduate and undergraduate)
Industrial Organization (graduate and undergraduate)
Managerial Economics (graduate and undergraduate)
Regulatory Economics
Game Theory
Public Finance (graduate and undergraduate)
Economics of Sports
Principles of Economics

CONSULTING EXPERIENCE

TESTIMONY

On behalf of Northwestern Energy at Montana Public Service Commission (2006), on default service procurement auction.

At Illinois Commerce Commission on default service procurement auctions, Docket Numbers 05-0159, 05-0160, 05-0161 and 05-0162, (Spring and Summer 2005).

At Public Utility Commission of Texas, on capacity entitlements auctions, Project Number 24492 (2001).

At New Jersey Board of Public Utilities, on auction design for Basic Generation Services, Docket Number EX 01110754 (2000).

Hearing of the International Competition Policy Advisory Committee on 3G standard setting procedures and competition policy, June 1999.

On behalf of the FCC in Nextwave Personal Communications Inc v. Federal Communications Commission, May, 1999

On behalf of PanCanadian at Alberta Energy Utilities Board (January, 1996) on pipeline cost allocation principles.

TELECOMMUNICATIONS:

- Spectrum Auction Bidder Support (mostly lead adviser)

(2017)	Sunrise (Switzerland)*
(2017)	KPN (Netherlands)
(2015 - 17)	US Incentive Auctions Sprint and Comcast*
(2015)	German multi-band, Canada AWS
(2014)	Canada 700 MHz, US AWS (#97)*, Poland
(2013)	Austria (multi-band)*, Canada, Slovakia, US
(2012)	Netherlands*, Belgium, Swiss 4G, France 4G auctions
(2011)	Spain 4G, Italy 4G*, Portugal 4G, Belgium 4G, Greece 4G
(2010)	German 4G*, Mexican AWS/PCS*, Indian 3G*, Mexico 3G
(2008)	US 700 (#73), Canadian AWS, Italian WiMax
(2006)	US AWS -1 (#66) *
(2005)	US PCS (#58) *
(2003)	US 700 (#49)
(2002)	Taiwan 3G
(2001)	US PCS (#35)*, Australian 3G*, Austrian 3G, Danish 3G, Dutch 3G

(2000) US 39 GHz (#30), Australian PCS*, UK 3G*, German 3G*

(1999) US PCS (#22)*, Canadian 24 and 38 GHz*

(1998) Dutch 2G, Telebras privatization, Mexico PCS

(1997) Brazil B block cellular

(1996) US PCS (#5), US MDS (#6), US SMR (#7)

(1994-5) US PCS (#4)*

Regulation and Wireless

Development of wireless industry simulation modeling team at Math Science Research Center at Bell Labs (2000–2001).

Advised Leap Wireless on the ATT and T-Mobile proposed merger (2010).

Advised E-Plus on wholesale roaming regulation (2009 – 2010).

Advised QUALCOMM on European 3G standard setting, including numerous filings and testimony (1999 – 2001)

Advised QUALCOMM on competition policy issues related to European competition policy matters (2005 – 2007)

Led team in developing GTE's Universal Service auction proposal (1995–6)

Project leader for wireless cost simulation model for GTE Labs (1989 – 93)

Advised Leap Wireless on wholesale roaming, prepared testimony (2005)

Advised SouthernLinc Wireless on wholesale roaming (2005)

Advising Canadian operator on wholesale roaming (2009)

Advised Indian operator on spectrum requirements for 3G (2008)

Advised Peru's OSIPTEL on rural service procurement auctions (1995)

- Spectrum Allocation and Auction Design

Advised Pakistan PTA on 3G auction (2013–4)

Advised Hungarian NMHH on auction design options (2012)

Advised satellite television operator on design of auction for television ads (2011)

Advised Telecommunications Regulatory Authority of India (2004).

Advised Industry Canada on 2300 MHz/3500 MHz auction (2003–4)

Advised UK Radiocommunications Agency on spectrum trading (2002)

Advised Netherlands DGTP on design of auction for sale of AM and FM frequency rights (2001–2)

Advised Italian Ministry of Communication in design of 3G spectrum auction (2000)

Advised on design of auction for ads in telephone directories (1999)

Advised Industry Canada on spectrum auctions for LMCS frequencies (1996) and 24/38 GHz frequencies (1999)

Designed and implemented first spectrum auction for paging licenses for the Mexican Ministry of Communications (SCT), November 1996

Designed and implemented first spectrum auction for trunk radio frequencies for the Guatemalan Superintendent of Telecommunications, May 1997

FCC experimental testing of combinatorial auction mechanisms (2000)

Advised IDA Singapore on 3G auctions (2001)
Advised IDA Singapore on wireless local loop auctions (2001)

Advised Australian ACA on 3G auctions (2000)

Advised Australian SMA on design of 500 MHz license spectrum auction (1996)

Led team that developed auction software adopted by Industry Canada (1995), the Mexican Ministry of Communications and Transport (1995) and the Guatemalan Superintendent of Telecommunications (1996 – 7).

Advised Colombia (Ministry of Communications) in draft auction legislation for spectrum auctions (1999).

Advised Peru (OSIPTEL) on spectrum allocations for universal service (1995).

ENERGY AND CHEMICALS:

Carbon credits auction design – North America (2016)

Advised on Energy Procurement, Southern California Edison (2009 – 10)

Advised First Energy Solutions on Bidding Strategy (2009)

Advised California Forward Capacity Markets Association on California Capacity Markets (2007).

Served as Auction Manager for Northwestern Energy default service procurement auction (2006). Testified at Montana Public Service Commission.

Advised NYSERDA on auction design and bidding procedures for NYSERDA Renewable Electricity Credit Procurement (2006).

Served as Auction Monitor for Illinois Commerce Commission (2005 - 6). Testified at Illinois Commerce Commission (2006).

Developed design and implementation plan for Empire Connection transmission rights auction (2003)

Developed and managed auction for Williams for selling ethylene (2003)

Developed auction design adopted by OMV for natural gas release program (2003)

Advised Acquirente Unico (Italy) on default service options (2002–3)

Advised Texas Utilities on energy entitlement auctions, and testified at PUCT (2001–2)

Developed Standard Offer Service procurement auction design for New Jersey Utilities (2000–2).

Advised Netherlands DTe on transmission rights auctions (2000)

Advised EPCOR on bidding strategy in Alberta PPA auction (2000)

Advised EPCOR on bidding strategy in Alberta Balancing Pool auction (2000)

Advised on bidding 3rd round PEDEVESA auction of oil lease rights in Venezuela (1996)

APPENDIX II

PROPOSED SWISS AUCTION RULES

1. General provisions

1.1. Lots

Category A: FDD frequencies in the 700 MHz band will be auctioned in 6 abstract frequency blocks of 2x5 MHz (paired).

Category B: SDL frequencies in the 700 MHz band will be auctioned in 3 abstract frequency blocks of 5 MHz (unpaired).

Category C1: Equipment-supported SDL frequencies in the 1400 MHz band will be auctioned in 8 abstract frequency blocks of 5 MHz (unpaired).

Category C2: Unsupported SDL frequencies in the 1400 MHz band will be auctioned in 10 abstract frequency blocks of 5 MHz (unpaired).

Category D: FDD frequencies in the 2.6 GHz band will be auctioned in 1 specific block of 2x5 MHz (paired).

Category E: TDD frequencies in the 3500 MHz band will be auctioned in 15 abstract frequency blocks of 20 MHz (unpaired).

1.2. Opening Minimum Bids

Category A: CHF 8,400,000
Category B: CHF 500,000
Category C1: CHF 2,100,000
Category C2: CHF 500,000
Category D: CHF 2,900,000
Category E: CHF 840,000

1.3. Award terms

1.3.1. The specific 2x5 MHz (paired) block of FDD spectrum in the 2.6 GHz band (Category D) will have a term of 10 years (through Dec 31, 2028).

1.3.2. All other blocks in all other categories will have a term of 15 years.

2. Conduct of the auction

2.1. Type of auction

The auction will be held as an open ascending simultaneous multi-round auction.

2.2. The bidder

The bidder is the undertaking that has qualified to take part in the auction. Bidders will be represented by authorized agents and those with powers of attorney.

2.2.1. Minimal essential package

As part of their application, bidders entitled to request the minimum frequency requirements for their business model (so-called minimum essential spectrum package).

Applicants requesting a minimum essential spectrum package but actively bidding for less during the auction will be eliminated from the entire proceedings.

Any minimum essential spectrum package requested should be set out accordingly in the frequency usage concept.

2.3. Bid submission

In each round, bidders can submit bids simultaneously and independently of one another and, subject to their eligibility, are free to choose which blocks to bid for.

Bids will be submitted electronically by means of special software.

2.4. Valid bids

In the first round the minimum valid bid is the minimum bid for a frequency block. In the subsequent rounds the minimum valid bid is a bid that exceeds the current highest bid for a frequency block by the current minimum bid increment. If no valid bid was made for a frequency block in the previous rounds, the minimum valid bid will count as the minimum bid. If the highest bid in a round is withdrawn (cf. subsection 2.11) and no new valid bid for this block is submitted in that round, the new minimum valid bid will be derived from the amount of the withdrawn highest bid plus the current minimum bid increment.

In each round, the software will provide a list for each frequency block showing the valid bids from which bidders can choose their bid amount (click box bidding).

The bidder may choose a bid from the following list of bid amounts:

- the minimum valid bid,
- the minimum valid bid plus CHF 1,000
- the minimum valid bid plus CHF 2,000
- the minimum valid bid plus CHF 5,000
- the minimum valid bid plus CHF 10,000
- the minimum valid bid plus CHF 20,000
- the minimum valid bid plus CHF 50,000

- the minimum valid bid plus CHF 100,000
- the minimum valid bid plus CHF 200,000
- the minimum valid bid plus CHF 500,000
- the minimum valid bid plus CHF 1,000,000
- the minimum valid bid plus CHF 2,000,000
- the minimum valid bid plus CHF 5,000,000
- the minimum valid bid plus CHF 10,000,000.

2.5. Restriction of bidding rights (spectrum caps)

2.5.1. Absolute caps

There are three "absolute caps" which are in force throughout the auction. These limit the number of blocks a bidder may be active on in any given round (cf. subsection 2.9). That is, the number of blocks on which a bidder either a) has a current highest bid (and does not submit a withdrawal) or b) submits a new valid bid (or both) cannot exceed these caps:

- **Category A**: 2 x 15 MHz (paired), or 4 blocks
- **Categories B, C1, C2 combined**: 45 MHz (unpaired), or 9 blocks.
- **Category C1**: 15 MHz (unpaired) or 3 blocks
- **Category E**: 100 MHz (unpaired), or 5 blocks[19]

2.5.2. Triggered cap reduction in Category A

Once block prices exceed CHF 25.2 M, bidding eligibility for Category A is restricted to a maximum of 2x10 MHz (paired) per bidder, or 2-blocks. That is, no bidder can submit bids – or be current high bidder – on 3 Category A blocks with bids of CHF 25.2 M or more on each block.

2.6. Minimum bid increment

If there is a highest bid for a frequency block after a round in the auction, the auctioneer will stipulate a minimum bid increment for it for the subsequent rounds.

The minimum bid increment is a particular (non-negative) sum of money by which the highest valid bid in a round must increase as a minimum.

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[19] Sunrise is advocating for 390 MHz to be allocated in Category E. If only 300 MHz is to be allocated, Sunrise advocates for a 100 MHz cap. If 390 MHz is to be allocated, then the block size in Category E would need to be 10 MHz and one lot rating each, the reserve price should be reduced by one half, and the cap could remain per Draft Rules, at 140 MHz.

In the first stage, the minimum bid increment is 5% of the designated highest bid. Depending on how the auction proceeds, the minimum bid increment can be lowered step by step by the auctioneer for further stages to 3% and 1% of the designated highest bid (incremental stages).

Diverging from this, the auctioneer can stipulate a specific amount for individual frequency blocks as the minimum bid increment.

The auctioneer will notify bidders at the start of a round of the level of the particular minimum bid increment, rounded to the next whole multiple of CHF 1,000.

2.7. Highest bids

At the end of every round the highest bid for each frequency block will be identified by evaluating the round. The highest bid is the highest active bid for a frequency block at the end of a round. If identical highest valid amounts are bid for a frequency block, the bidder who submitted his bid first will be considered to have the highest bid. The current highest bid for a frequency block will be designated as such at the beginning of the next round.

2.8. Lot ratings

Standardized numerical values are determined for every frequency block depending on its spectral extent (known as lot ratings).

- A frequency block of 2 x 5 MHz (paired) in Category A is given a lot rating of 2.
- A frequency block of 5 MHz (unpaired) in Category B is given a lot rating of 1.
- A frequency block of 5 MHz (unpaired) in Category C1 is given a lot rating of 1.
- A frequency block of 5 MHz (unpaired) in Category C2 is given a lot rating of 1.
- A frequency block of 2 x 5 MHz (paired) in Category D is given a lot rating of 1.
- A frequency block of 20 MHz (unpaired) in Category E is given a lot rating of 2.

Bidding eligibility is given in lot ratings.

2.9. Activity rules

A bidder's activity in a round is the sum of all eligibility points, in lot ratings, used for frequency blocks for which the bidder has submitted an active bid.

An active bid for a block in a round is deemed to have been given when, at the beginning of the round, either the bidder holds the highest bid for the block – and does not withdraw it in the current round as set out in subsection 2.11 – or submits a valid bid for a block in the current round in accordance with subsection 2.4.

A bidder’s activity can never exceed his eligibility.

A bidder must exercise his bidding eligibility to a certain extent if he is not to lose any (minimum level of activity), unless he makes use of a waiver as provided for in subsection 2.10.

The auction is divided into three consecutive activity phases:

- Activity phase 1 requires a minimum activity level of 65% of the current bidding eligibility.
- Activity phase 2 requires a minimum activity level of 80% of the current bidding eligibility.
- Activity phase 3 requires a minimum activity level of 100 % of the current bidding eligibility.

The auctioneer will decide when to move on to the next activity phase in accordance with the progress of the auction.

The minimum activity level determines the minimum activity a bidder has to engage in. Minimum activity is derived from the product of the number of the bidder's eligibility points and the minimum activity level in the particular activity phase, rounded up to the next highest whole number.

A bidder keeps his full bidding eligibility for the next round if he has complied with or surpassed the minimum activity level in the current round.

If a bidder falls below the minimum activity level and does not use a waiver (cf. subsection 2.10), his bidding eligibility will be determined anew for the next round:

- in activity phase 1 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/65.
- in activity phase2 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/80.
- in activity phase3 by multiplying his activity level (sum of the lot ratings for frequency blocks for which an active bid has been submitted) by 100/100.

A bidder not submitting a new valid bid in a round for any frequency block, not holding a highest bid and not using a waiver (active or passive) as provided for in subsection 2.10, will be eliminated from the auction.

Notwithstanding this activity rule, a bidder must in any case place bids to match the extent of the minimum essential spectrum package he has specified (cf. subsection 2.2.1). If fewer bids are placed than the minimum essential spectrum package agreed, the bidder will lose all his bidding eligibility and will be eliminated from the auction, provided he has not used any waivers (active or passive) as specified in subsection 2.10.

2.10. Waivers

Each bidder will be given five waivers that he can use in five different rounds. Using a waiver means that no eligibility points will be lost in the particular round (cf. subsection 2.9).

A distinction is made between active and passive waivers.

Active use of a waiver is made by activating a command to this effect in the software (active waiver).

There are two possibilities of use:

- A bidder can sit out a whole round, i.e. he does not submit a valid bid and does not withdraw a bid in the particular round. In this case he does not lose any eligibility points.
- He can also submit valid bids and/or withdraw bids and – as long as he remains under the required minimum activity level – can avoid his eligibility being reduced by active use of the waiver.

If the bidder engages in less than the minimum activity level but places bids to match his minimum essential spectrum package, the bidder can explicitly decide to do without a waiver. In this case he will lose eligibility points (cf. subsection 2.9).

This form of active waiver is not available to a bidder with an agreed minimum essential spectrum package unless he has placed bids to the extent of his minimum essential spectrum package.

A passive waiver, by contrast, is automatically effected by the software when the bidder allows time to elapse in a round without submitting a valid bid or withdrawing a bid and he falls below the minimum activity level even with his highest bids (cf. subsection 2.9). A passive waiver has no effect on the termination rule (cf. subsection 2.16).

2.11. Withdrawal of highest bids

Every bidder is entitled to withdraw, in part or in full, the highest bids he holds in ten rounds of the auction. A bidder can also submit new valid bids in the same round with the entitlements that have been released.

A bidder is not permitted to withdraw a bid if this would mean falling below his agreed minimum essential spectrum package in the particular round.

Withdrawal of a bid does not have any effect on the termination rule of the auction (cf. subsection 2.16). If a bidder withdraws one or more bids in the last activity phase and none of the bidders submits a new valid bid or uses an active waiver, the auction will end.

A bidder withdrawing a bid will be bound by his bid to pay if no new valid bid is made for the frequency block in question in the course of the first stage of the auction. In this case the bidder will be obliged to pay a sum equivalent to the bid he has withdrawn.

If the frequency block is awarded in a second stage, the price bid for the block will be deducted from the amount the withdrawing bidder has to pay.

2.12. Time of a round, completion of a round, discontinuation of a round and suspension of the auction

At the beginning of the auction, the time for a round in which bids can be submitted is 60 minutes. The auctioneer may set a different time before the start of a round, after due consideration of the circumstances.

There will be an automatic reminder ten minutes before the round expires.

A round is completed after the bids from all the bidders have been received by the auctioneer or after expiry of the specified time period for the submission of bids. A round is closed after evaluation by the auctioneer.

The auctioneer may discontinue a round not yet completed if there is a technical defect in the equipment needed for conducting the auction or if other reasons jeopardize proper conduct of the auction. In this case the auction will resume with the result of the previous round.

Each bidder will be given one opportunity to request the auctioneer to suspend the auction. Upon request, it can also be suspended during a round. The request must be declared for the record with the auctioneer. The auction will then be continued at 13:00 hours (CET) on the next working day.

Bidders will be notified of the reason for and length of any suspension of the auction.

2.13. Provision of information to bidders

The auctioneer will provide every bidder with the following information at the start of a round:

- the current round,
- the current activity phase (cf. subsection 2.9),
- the duration of the round (cf. subsection 2.12),
- the highest bid and the correspondingly highest bidder for each frequency block (cf. subsection 2.7),
- the minimum valid bid and the minimum bid increment for each frequency block (cf. subsections 2.4 and 2.6),

- a click box list of valid bids from which bidders can choose their bid amount (cf. subsection 2.4),
- the extent of their current eligibility (in lot ratings) and their minimum activity level in the current round (cf. subsection 2.9),
- the number of their waivers remaining (cf. subsection 2.10),
- the number of their bid withdrawal opportunities remaining (cf. subsection 2.11),
- the names of bidders eliminated or excluded.

At the close of every round the auctioneer will inform every bidder of the current highest bid for each frequency block and the active bids of all the bidders and their identity by means of special software. This information will also be provided electronically to the authorized agents in the bidder's room for further processing.

2.14. Exclusion of bidders/collusion

Any bidders working together before or during the auction to influence the course or the result of the auction (colluding) may be excluded from taking part in the entire proceedings. Bidders may also be excluded from taking part as a result of irregular behavior or as a result of holding up proper conduct of the auction.

An excluded bidder is bound by his bid to pay if, in the course of the auction, no new valid bid is submitted to take the place of the highest bid he held at the time of exclusion. In this case he must pay the amount of his highest bid. If the frequency block is awarded in the second stage of the auction (cf. subsection 2.18) to another bidder, the bid price for the block will be deducted from the amount to be paid by the excluded bidder. If the price for the particular frequency block in the second stage is higher or the same as the highest bid in the first stage of the auction, the excluded bidder is not obliged to pay.

The frequency block will not be awarded to the excluded bidder.

If collusive or irregular behavior is only established after the auction has closed, award and/or frequency assignment will be revoked. A highest bidder shall remain bound by his bid to pay. He must also meet his payment obligation for withdrawing his bids (cf. subsection 2.11). Payments made will not be refunded.

2.15. Elimination from the auction

A bidder will be eliminated from the auction if he has no more eligibility points (cf. subsection 2.9) or has been excluded (cf. subsection 2.14).

2.16. End of the auction (termination rule)

The auction will end if no valid bid has been made in the last activity phase for any frequency block and none of the bidders has used an active waiver. The final result of the auction will be announced by the auctioneer.

If, in an earlier activity phase of the auction, no valid bid has been submitted in a round and none of the bidders has used an active waiver and if all the eligibility points are bound by highest bids, it is up to the auctioneer to continue the auction by taking it into the next activity phase or to end it directly.

The auction can also end through discontinuation. The auctioneer may discontinue the auction if there is a technical defect in the equipment necessary for auction conduct, if bidders collude, or if other reasons jeopardize the proper conduct of the auction. In this case, the auctioneer will set a date for a new auction.

2.17. Award

The bidder holding the highest bid for a frequency block at the end of the auction will be awarded the block. Bidders with an agreed minimum essential spectrum package will be awarded the spectrum only if they have won their minimum essential package at least.

The award price will be equal to the highest bid submitted by the particular bidder. Award will be made in writing. The award notice will be presented after the auction.

A frequency award for which there is

- no valid bid at the end of the auction,
- no new valid bid was submitted after a bid was withdrawn,
- award was denied, or
- there is a bid, but the highest bidder failed to acquire his agreed minimum essential spectrum package,

will not be awarded in the auction.

2.18. Second stage of the auction

If frequency blocks have not been awarded at the close of the first stage of the auction (cf. subsection 2.17), the auctioneer will decide within two working days on whether, and if so when, these blocks should be auctioned in full or in part in a second stage.

Provided that it is appropriate to award the frequencies in a second stage, the following arrangements will apply as a general rule:

- Eligibility will also be restricted in the second stage as a result of the caps (cf. Section 2.5). Spectrum won in the first stage will count toward these caps.
- The same minimum bids for the frequency blocks will apply in the second stage of the auction as in the first stage.
- For the second stage of the auction, the same auction rules will apply as for the first stage, with the following exceptions:
    - Only bidders that have been awarded one or more frequency blocks in the first stage will be eligible to take part.
    - The maximum number of eligibility points in the second stage will be derived from the difference between the number of eligibility points established as a result of application and the eligibility successfully used

in the first stage. Bidders may also submit bids for frequency blocks for which they withdrew a bid in the first stage.
- Bid withdrawal is not possible.
- A minimum essential spectrum package cannot be requested.

3. Auction close

3.1. Obligation to pay

The bidder awarded a frequency block at the close of the auction must pay the amount of his highest bid.

A bidder that has withdrawn a current highest bid must pay his highest bid if no new valid bid is made for the frequency block in question in the course of the first stage of the auction. If the frequency block is awarded in the second stage of the auction, the price bid for the block will be deducted from the amount the withdrawing bidder has to pay (cf. subsection 2.11)

The award notice will be presented together with the notice of amount payable against acknowledgement of receipt. Payment is due immediately after presentation of the notice of amount payable.

3.2. Allotment of the abstract frequency blocks won

At the end of the auction the abstract frequency blocks won will be allotted to their highest bidders. The allotment proceedings are carried out in an objective, transparent and non-discriminatory manner in accordance with the following rules:

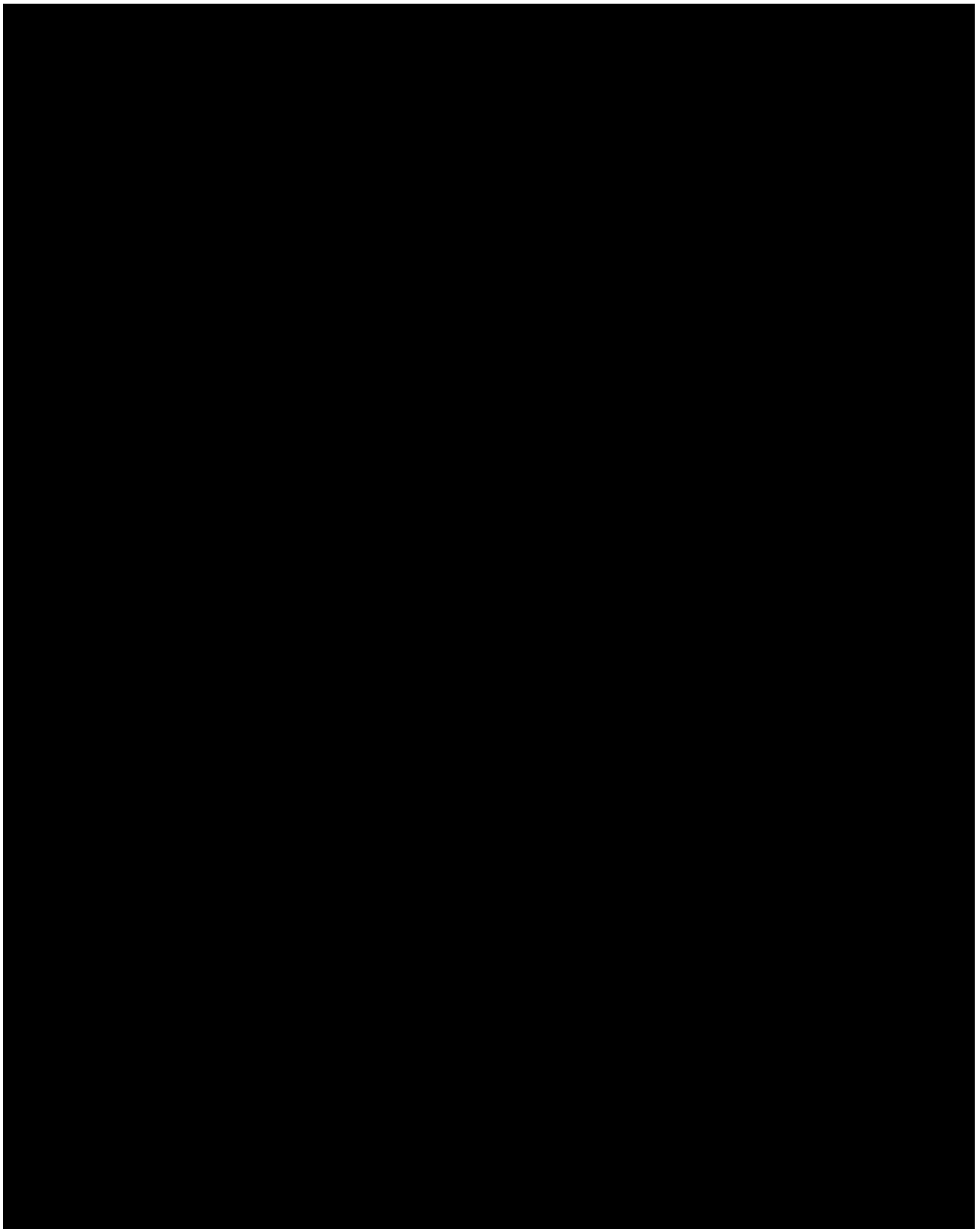
3.2.1. Successful bidders have the possibility of reaching agreement within a period of one month from the close of auction on the specific location of the blocks auctioned in the specific frequency band.

3.2.2. Insofar as no agreement is reached between all the successful bidders involved before the end of the set deadline, the auctioneer may allot the abstract frequency blocks won taking account of current use, of contiguous spectrum and of any preferences stated.

3.2.3. If there are abstract frequency blocks that have been won and awarded but cannot be allotted in accordance with the principles under point 2 above, their allotment will be decided by lot.

APPENDIX III

Example 1: [redacted]

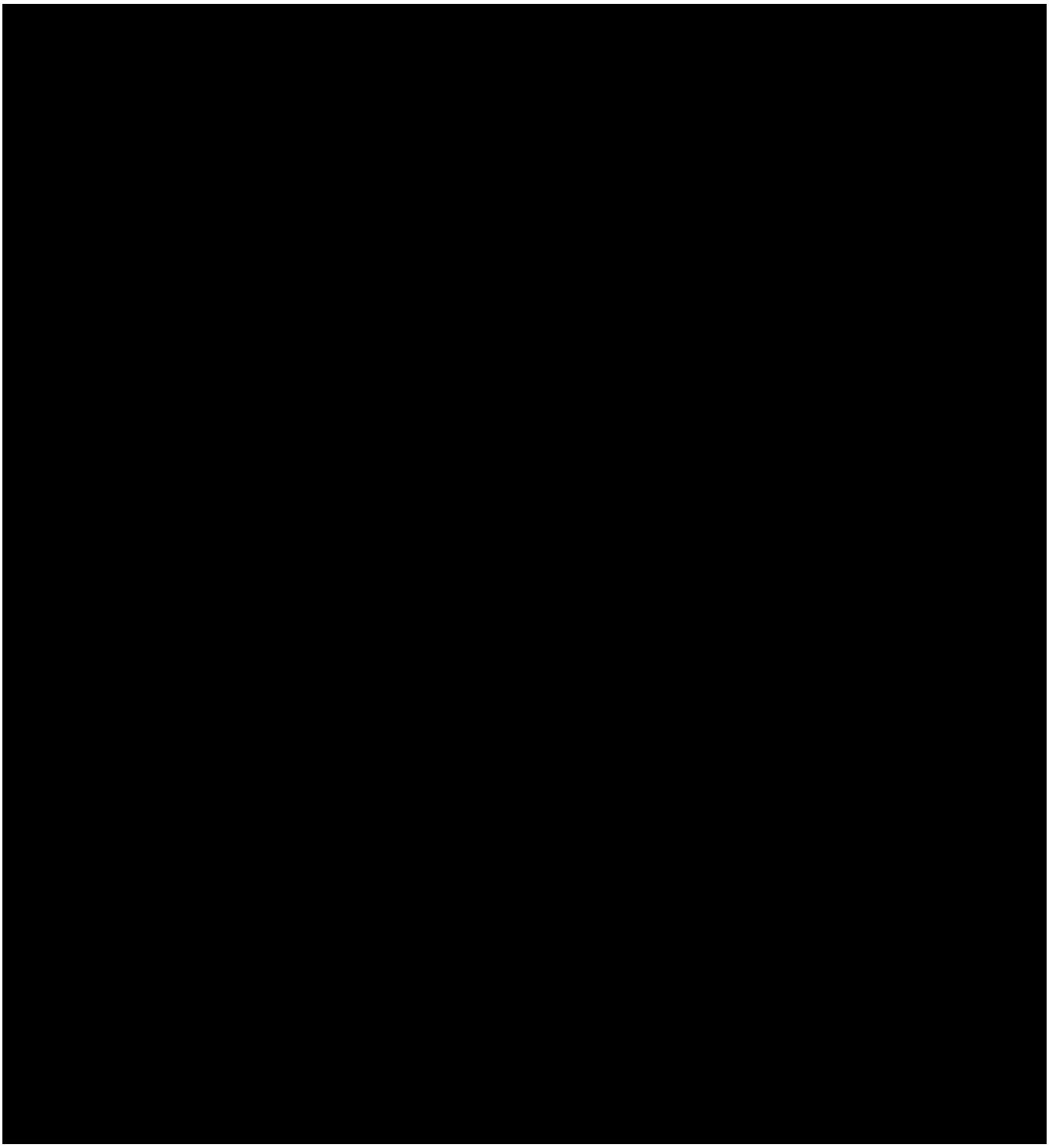


[redacted]

Example 2: [redacted]

[redacted]

[redacted]



[1] .